PRACTICAL KNOWLEDGE FOR ALL

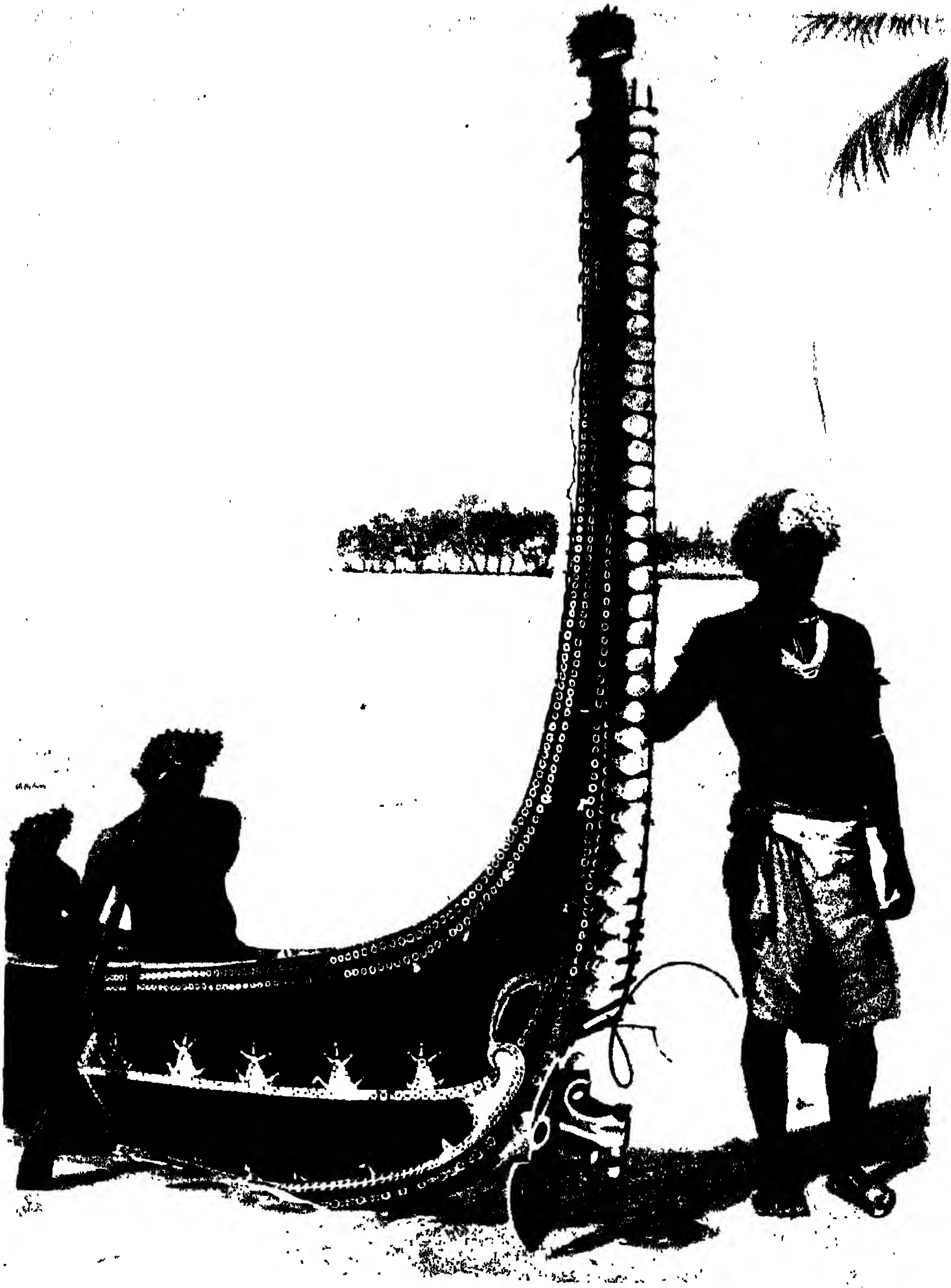
Volume 2

COURSES IN THIS VOLUME

On each of the pages indicated above is printed a detailed schedule of the Lessons making up that particular Course.

COLOUR PLATES IN THIS VOLUME

For ready reference to any item in text or illustrations consult the General Index at the end of Volume 5



H. T. Shepstone

SOUTH SEA ISLANDS. Solomon Islanders decorate war canoes with mother-of-pearl and cowry shells. The carved figurehead is a charm supposed to ward off danger from the vessel and its crew.

Frontispiece, Vol. 2

SOCIAL ANTHROPOLOGY, LESSON 16

PRACTICAL KNOWLEDGE FOR ALL

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SOCIAL ANTHROPOLOGY

MAN'S nature, his manners and customs, his methods of securing food, his beliefs and rites, constitute this Course of Lessons. Man is dealt with here not as the citizen of an urbanised and industrialised community but in the primitive relations of clan and family, in the universal experiences of birth, marriage, parenthood, and death. Courses with a bearing on Anthropological study include PSYCHOLOGY (*Vol.* 3), SOCIAL HISTORY (*Vol.* 4), *and* POLITICS (*Vol.* 5).

18 LESSONS

LESSON 1

The Study of Mankind

ANTHROPOLOGY means, simply, "the study of man." But no anthropologist would claim to study man in all aspects, for the field is a very wide one and in course of time it has become divided into a number of special branches, all of which overlap.

Anthropology taken as a whole involves studies of a biological, historical, and sociological kind. Students of anthropology at English universities are expected to take courses in physical anthropology, prehistoric archaeology, ethnology, comparative technology, social and cultural anthropology, ethnography, and sometimes in other subjects such as general linguistics, geography, economics, sociology, and psychology.

No anthropologist can hope to be a specialist in all branches of his subject. When the student has obtained a general background knowledge of the whole field he usually begins to specialise in one or more of these related studies. In these Lessons it is not possible to cover the whole field. The Course concentrates on that part of the study of man which comprises social anthropology, comparative technology, and ethnography, all of which are closely related to each other.

Branches of Anthropology

Consider, briefly, what the other branches of the subject involve. *Physical anthropology* is a branch of human biology. It is concerned with man as an animal and with his relations to the rest of the animal kingdom. It studies the evolution of the primates, the group to which man belongs, and more particularly the early evolution of man as deduced from comparative anatomy and the study of fossil remains. (The scientific study of fossils is called palaeontology.)

In studying living varieties of man physical anthropology compares the anatomy and physiology of racial types and takes account of sex differences, heredity, environment, nutrition, etc. It makes use of the various biological sciences such as genetics, anatomy, physiology, and pathology, but it emphasises the comparison of populations rather than individuals In most respects, therefore, physical anthropology has closer relations with the biological sciences than with the social sciences and humanities, to which the rest of anthropology belongs.

Reconstruction of History

The aim of *prehistoric archaeology* is to reconstruct the history of peoples from their remains which can be excavated from geological deposits. In practice it forms a separate science with its own theory, methods, and techniques, although its findings may be of great interest for the social and cultural anthropologist.

Ethnologists, too, in the sense in which the term is used in Britain, are concerned with the reconstruction of history, but they go about it in a different way. Their aim is to explain the distribution of racial and cultural characteristics of peoples in the present day or in the past by the movement and mixing of peoples and the diffusion of culture.

Blacksmith Communities

Comparative technology is closely bound up with archaeology and ethnology ; it is also of great interest for the social anthropologist, for it studies man as a maker and user of the tools with which he attempts to control and derive benefit from his environment. The making and using of these tools plays a great part in his social and cultural life. In many societies, for instance, people form themselves into groups according to their trade.

In West Africa there are communities of blacksmiths who are set apart from the rest of the people among whom they live. The Ineme smiths of Southern Nigeria do not intermarry with the surrounding peoples although they speak the same language, and, apart from their craft, lead very similar lives. In Benin City, Nigeria, there are a large number of wards whose populations are distinguished by special skills—bronze-casting, weaving, wood-carving, leatherwork, etc. Canoe-building in some Pacific Islands was a craft formerly restricted to certain families. The Freemasons had their origin in a common craft.

Social Behaviour

What is meant by *social anthropology*? Professor Evans-Pritchard of Oxford University has put it this way. "Social anthropology . . . studies . . . social behaviour, generally in institutionalised forms, such as the family, kinship systems, political organization, legal procedures, religious cults, and the like, and the relations between such institutions ; and it studies them either in contemporaneous societies or in historical societies for which there is adequate information of the kind to make such studies feasible."

The social anthropologist uses much the same body of facts as the ethnologist, but for a different purpose. His aim is not to reconstruct the movements of peoples and the diffusion of culture but to understand any piece of social behaviour as "part of the whole social life of the people" at the time at which he is studying them.

A considerable part of the anthropologist's time is spent in collecting and describing his material, and this part of the work is usually called *ethnography* The anthropologist may, and often does, use the material collected by other ethnographers, but in practice he is usually an ethnographer himself and most anthropologists spend a part of their life doing fieldwork: that is, living in the community which they are studying and observing it at close quarters. Ethnography, then, is an essential part of social anthropology.

Primitive Peoples

What kind of society does the anthropologist study? Theoretically, he does not limit himself to any kind of society, and anthropological studies have been made in Japan, Ireland, the U.S.A., and other countries, among technically advanced peoples. Up to date, however, the great majority of anthropological works have concerned themselves with what are called " primitive peoples." The word " primitive " unfortunately carries unpleasant overtones of inferiority, but no more satisfactory word has come into common use.

When " primitive " is used in these Lessons it is not intended to imply inferiority ; it means, simply, that the society so described is small in scale, that its numbers are relatively few, its territory small, its range of social contacts limited, and its economy and technology simple when compared with modern industrial societies.

One of the reasons for paying so much attention to this kind of society is its simplicity in social relations. This makes it easier to see the society as a whole and to understand how its different groups and institutions fit together. Where social relations are relatively simple it is easier to assess the importance of any piece of social behaviour.

Then again, it is easier to be objective about societies which are very different from our own and in which we are not ourselves involved A third reason is that at the present day most of these societies are changing very rapidly and it is desirable to record them while some of their most important features are still recognizable.

Bearing in mind Evans-Pritchard's definition of the aims of the social anthropologist we can now go on to consider some of the topics which have attracted attention. In doing so it will be found that customs and habits which at first sight are absurd and bizarre seem not unreasonable when more is known about the social life of the people who practise them.

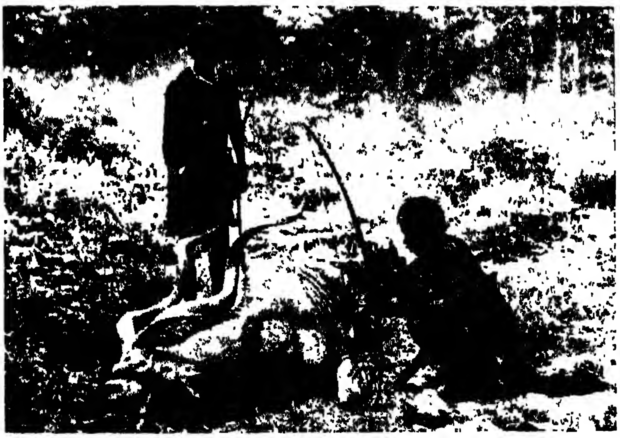
LESSON 2

Collecting, Hunting, and Fishing

One of the first preoccupations of any human society is the provision of food and other essentials of life for its members This is especially true of simple peoples whose economies are at, or close to, the subsistence level ; peoples, that is to say, who produce all, or the greater part, of what they consume. The way in which a people gets its living is naturally of importance for the understanding of the rest of its social life.

Cultivation and the domestication of animals for food are relatively late developments in the history of mankind. They were preceded everywhere by what may be called gathering techniques– hunting, fishing, and the collection of insects, eggs, etc., and vegetable foods. This once universal condition of mankind is represented at the present day by a number of peoples scattered in many different parts of the world and in every kind of environment from the equatorial forest to the arctic tundra.

Though we group the food gatherers together to distinguish them from cultivators and pastoralists, it should be realized that they vary widely among themselves. This is inevitable ; for they inhabit a great variety of environments with widely differing resources, and they have different techniques for dealing with these environments. Each group has its own history of invention,



A KILL IN THE KALAHARI. The Bushmen, although among the simplest of human societies, are expert hunters. They stalk their quarry with stealthy cunning, shoot it with poisoned arrows, and follow its spoor until it drops dead.

BLOW PIPE MARKSMEN. One of the weapons used by the primitive hunters of south-eastern Asia is the blow-pipe, discharging a dart dipped in poison. Here a Bornean marksman displays his pipe—a tube seven feet long—to a group of admiring youths.

discovery, and contacts with other peoples from whom it may have acquired new skills and equipment.

Generally speaking, the most backward peoples known in modern times have been the most isolated, and the introduction of new elements into a culture from the outside may profoundly modify a society's way of life. An outstanding example is the introduction of the horse into North America by the Spaniards in the 16th century.

Horse and Sheep

The horse flourished on the open grasslands of the Great Plains, and the Indians there soon learned to ride it and to use it in hunting bison and antelope. This increased their efficiency enormously and gave them more wealth, property, and leisure, the result being a general enrichment of their social life.

The Navajo of the American south-west were transformed, after the introduction of the horse and sheep, from a food-gathering to a pastoral people. At the present day when most simple communities are in close contact with Western industrial civilization vast changes are being brought about in their economy and social life.

Different histories result not only in varying skills and techniques but in different traditions and preferences, and every environment permits some degree of choice to its inhabitants in the use of its resources. Some peoples are known to spend a disproportionate amount of time in seeking foods less nutritious than others which though more easily obtainable are less appreciated. Tastes, in the widest sense of the word, differ as much as techniques and environments, and one should think of any economy as catering to wants rather than mere needs.

Specialised Technologies

Environment and resources do not entirely determine and control the way of life of any people, though they may set narrow limits to it—as among the Eskimo, who are able to exist at all only because they have a very highly specialised technology. Compare the natives of the Pacific coast of British Columbia with those of Tasmania: the former, on the basis of a highly-specialised fishing economy, have evolved a rich and complex culture and society.

They live in permanent villages of well-constructed timber houses, each with its elaborately carved totem pole; they are skilled carpenters, building very fine sea-going canoes; their wood-carving is among the most remarkable artistic achievements of the New World; and they produce a large economic surplus which has given rise to a system of rank and a class structure based on differences of wealth.

Living in a not very dissimilar environment, with perhaps equal resources, the poorly-equipped Tasmanians were the most backward people known in modern times. Isolated as they were, they developed no effective techniques of wood-carving or food storage. They made no good use of stone implements and had neither the bow nor the spear-thrower, both of which were used by their nearest neighbours, the Australian aborigines. They lived in bands of fewer than 50 people scattered through the forest in temporary camps, and their only habitations were rude windbreaks of boughs and sheets of bark. Unable to adjust themselves to the coming of Europeans, they quickly died out.

Indians and Bushmen

Some hunting and fishing societies have developed highly specialised economies. The Plains Indians depended on the bison to such an extent that they had almost exterminated it in 200 years from the introduction there of the horse. The Bushmen of the Kalahari desert area in south-west Africa concentrate on large

wild game of all kinds. The Kwakiutl and Haida of British Columbia live very largely on marine life, especially salmon. Collectors of vegetable foods are, on the whole, less narrowly specialised, though one item may be outstanding ; acorns ground into a meal and cooked was the daily food of the Yokuts of Central California.

In contrast, the Paiute of the Great Basin in North America collect a wide variety of grass-seeds, berries, bulbs, and roots and, unlike many food-gatherers, they store large quantities to tide them over late winter and the spring.

Specialisation is nowhere complete among hunters, fishers, or collectors. The Semang of Malaya, who are among the most simple collecting peoples, avoid big game such as tigers, leopards, and elephants, for a fire-hardened stake and poisoned arrows are their only weapons ; but they kill and trap smaller animals, and they fish with spears and simple traps. Frequently, in societies which depend chiefly upon hunting and fishing it is the women's duty to collect subsidiary foods.

Guarded Territories

Along with specialised gathering economies go specialised skills and techniques. Even the simplest gatherers have a considerable knowledge of plants and their uses; the Semang know how to remove poisonous juices from some of their more valuable roots and fruits.

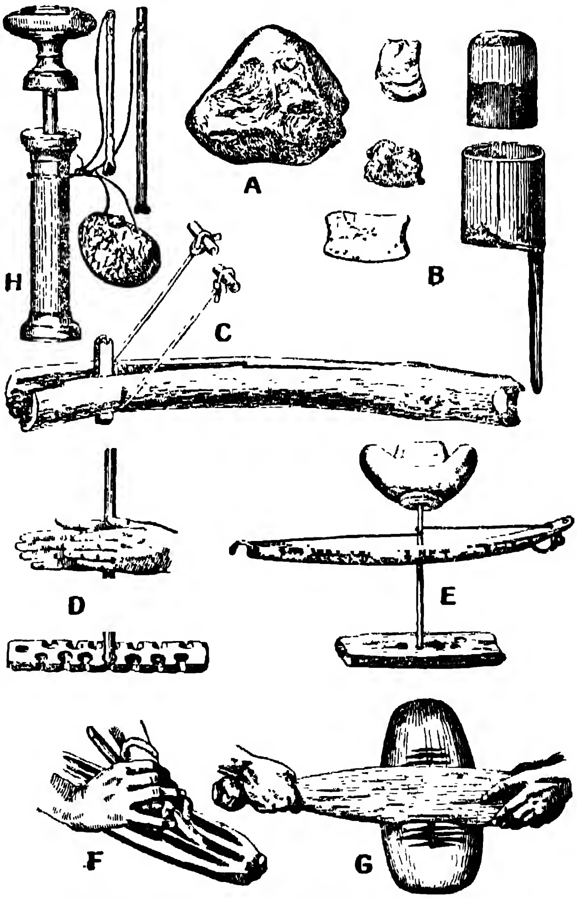
The Bushmen are skilled in the use of disguises and animal cries for deceiving their prey; they dress up in ostrich skins, for instance, and are thus able to approach these birds undetected. Most remarkable, perhaps, is the elaborate technology which the Eskimo has developed in coping with the most difficult of all inhabited regions.

Contrary to what might be expected, food gatherers scarcely ever wander homeless through unrestricted areas. They live, for the most part, in social groups, closely attached to well-defined territories which they often guard jealously from trespassers. The Semang, for example, are split up into bands of rarely more than 20 or 30 people, all closely related.

Each band owns a territory of about 20 square miles, but because in the equatorial forest there is rarely any concentration of plant species these bands are forced to be almost continually on the move. They can wander and gather on the land of nearby groups but they always return to their own territory for the harvest of the fruit of the durian tree, their principal food. These trees are owned and inherited by individuals, and while it is legitimate to seek other products on neighbouring lands the taking of the durian fruit would lead to violence.

Australian social groups are more firmly attached to their own territories. Among the Kariera a horde, which is an extended family of up to 75 individuals, owns its own territory and no member of another horde may hunt in or even enter it without permission.

The Paiute of the Great Basin in North America live in bands of about 100 people occupying 50 to 100 square miles of land. During the warmer half of the year they split up into groups of one or two small families, and these wander about gathering vegetable products, etc. ; in the winter they come together in one or two fairly large settlements, and this



FIRE-MAKING INSTRUMENTS. Few tribes lack the knowledge of how to make fire. Here are some of the many ways in which it is produced. A. Lump of ore (Tierra del Fuego). B. Flint and steel (Burma). C. Wood and bamboo strip (Malay States). D. Twirling (Africa). E. Bow-drill (Eskimo). F. Stick and groove (Oceania). G. Sawing (with spear-thrower on shield, Australia). H. Fire-piston (Borneo).

British Museum by permission of the Trustees

concentration enables them to hold mass rabbit drives which are followed by ceremonies and dances of celebration.

The social groups among the Plains Indians were larger. The three independent tribes of the Blackfoot together probably numbered over 10,000, but each tribe was an effective social unit only in the summer. In the winter it was split up into as many as 20 bands, each with its own defined territory During the summer, when it was possible to hunt bison herds by mass attack, the whole tribe assembled.

The Kwakiutl of the north-west coast, and neighbouring peoples, though they moved through a number of sites during the year in order to exploit particular resources, had permanent villages which remained in the same place for generations. Such villages might contain 30 houses and be inhabited by several hundred people

Bearing in mind the foregoing, one may make the following generalisations about food gatherers (remembering also that they are so diversified that it will always be possible to find exceptions).

1. Except in specially favoured conditions food gathering is not able to support densely concentrated populations.

2. Food gatherers are usually organized into small-scale social units, the members of which are, frequently, close relatives. The individual family is often the effective economic unit, though larger groups may come together for particular operations.

3. These social groups are usually attached to definite territories, though they may wander over considerable areas.

4. Except in special conditions, as in British Columbia, where ample resources and advanced techniques have been brought into contact, and to a lesser extent among the Plains Indians, gathering techniques do not normally give rise to large economic surpluses or great differences in wealth within the society. The development of social or economic classes is thus almost unknown among people at this stage.

LESSON 3

Cultivation of Food Plants

The discovery of techniques of food production by the domestication of plants and animals constitutes one of the most important revolutions in the history of mankind. It enables man to have greater control over his food supply and, given a suitable environment, to make more effective use of the resources at his disposal. The potential consequences of this are far-reaching.

More people can be supported on a given area of land, population densities may thus be increased, and the scene is set for more complex social and political arrangements. Foresight and long-range planning are encouraged, and increased productivity may give an economic surplus which will afford more leisure and more time to devote to other than food-getting pursuits. In these conditions man can develop new skills, and occupational specialisation becomes possible. Social relations tend to become more complicated.

BREAD FROM POISONOUS ROOTS. A principal food of the Amazon Indians is the manioc root after the hydrocyanic (prussic) acid which it contains has been squeezed out. These girls are rasping the roots, after which the resulting meal is pressed into cakes and roasted.

The problem of the date and place of origin of food-production techniques belongs to the study of prehistoric archaeology, and this Course is not concerned with it. Instead, there will be considered some types, methods, and results of food production found among primitive peoples known in modern times. This Lesson deals with cultivation of food plants, the next with pastoralism.

There are one or two peoples who appear to stand on the border line between collecting and cultivating techniques. Australian aboriginal women tend patches of wild yams. Some of the Paiute of the Great Basin in North America control their supply of grass seeds by gathering only in certain areas each year. They contrive, too, to irrigate patches of wild grasses by diverting streams over them, and they sometimes approach a step nearer to cultivation by scattering seed on these well-watered areas.

The tools of the most primitive cultivators are very simple. Many have only a digging-stick which can be used to break up the soil and make holes for seeds and cuttings--an instrument known also to food gatherers, who use it for digging up roots. With it the soil can be worked only superficially; more adequate tillage demands the use of the hoe.

The latter is in use only where there is knowledge of iron-working -in Africa and Asia among primitive cultivators. Stone hoes may have been used in the Old World in the past, but they were unknown in Oceania and the pre-Columbian Americas. With the adoption of the plough, manuring, and irrigation, productivity can be still further increased; but these are, for the most part, found only in more advanced societies.

Storage of Crops

In tropical forests, where there is adequate rainfall and no prolonged drought, cultivation tends to centre on roots and fruits, though maize and millet have been widely adopted during the last few centuries. Tubers such as yams, taro, and cassava have an advantage over grains in that they can be harvested over much longer periods and storage is not such an important problem. The cassava-producing Boro of the Amazon forest store very little

Where there is a more complex economy with well-developed trading and occupational specialisation, and where social obligations demand elaborate entertaining, considerable amounts may be stored. This is true of some Oceanian islands and of the kingdoms of West Africa.

As among the food gatherers, environment and resources do not completely dictate standards of production and of economic and cultural achievement. In Oceania most Polynesians are better farmers than most Melanesians, though conditions are less favourable for root crops in the drier, more easterly, Polynesian islands.

The Polynesians cultivate in terraces irrigated by the diversion of streams. They supplement their agriculture by more efficient pig-rearing and intensive fishing, though their fishing equipment is not notably superior to that of the Melanesians. In the same way there are great variations in economic and cultural standards among the millet growers of Africa and the maize producers of America. Nor can grain-producers as a whole be separated from tropical forest cultivators in terms of economic and cultural achievements or complexity of social organization.

In primitive methods of agriculture only the top layer of soil is made use of and in regions of heavy rainfall the essential minerals are quickly removed therefrom. Unless there are methods of replacing these minerals the soil is soon exhausted and new areas have to be brought under cultivation. Thus it may be necessary for the farmers to shift their habitations from time to time in search of new land. The Iroquois, among the best maize-farmers of the eastern United States, had to move their villages

SLASH AND BURN IN WEST AFRICA. In southern Nigeria land is cleared and burned each year for the planting of yam After one or two years' cultivation a cropped area is rested for as long a period as possible.
Photo R St Barbe Baker

every ten years. Some of the great slow migrations over the world must be attributed to the pressure of population on exhausted soils.

Slash and Burn

Over most of Africa south of the Sahara the "slash and burn" technique of agriculture is followed. New land is cleared each year and the cut-down vegetation burnt. The ash is left in place and, after hoeing, the seeds and cuttings are planted in it. In some parts of southern Nigeria each plot is planted for two or three years in succession; but yams, the most important crop, thrive only in the first year. After the last crops are harvested the land is allowed to lie fallow for a number of years.

Where there is heavy rainfall the bush regenerates rapidly and it may not be necessary for settlements to move, provided the population does not grow too fast. Among the Edo of southern Nigeria each village has enough land to supply every household and to allow a fallow period of from five to 20 or more years.

Under digging-stick and hoe cultivation there

are, of course, strict limits to the density of population which any particular area can carry at a reasonable standard of living. The Bemba of Northern Rhodesia have been described as a people who constantly live close to the borders of starvation.

GATHERING SEA SLUGS FOR CHINESE GOURMETS. Gathering plays its part even in the diet of sedentary agriculturists. Large quantities of bêche de mer or trepang (sea slugs) are collected by the aborigines of the Coral Sea islands off Northern Australia for the Chinese market.

Hillside Irrigation

Even in areas where the plough is unknown it may be possible to farm the same patch of land over a considerable period. The Hopi of the Arizona desert, on whose fields there is a slow accumulation of silt from mountain streams, can farm them year after year by spacing their crop-plants widely ; but productivity is very low.

The Igorot and Ifugao of the Philippines terrace and irrigate their hillside rice-fields very skilfully, though their only digging tool is a long wooden paddle Advanced as their agriculture is, their social and cultural achievements, according to Professor Daryll Forde, are closer to those of an African forest people than to the rice growers of the sub-continent of India and of China.

All primitive cultivators depend upon a variety of crops, the main crop often being interplanted with rows of other food plants. In southern Nigeria the main yam crop is often the concern of the men, while the woman plant a wide range of peppers, gourds, legumes, and other plants. Often cultivators continue to supplement their food supply by hunting, fishing, and collecting.

Both men and women farm in Polynesia, but fishing is still a very important part of the economy and it is the occupation from which a man may gain most prestige. Where more intensive agricultural methods are used these pursuits may become specialised occupations and, naturally, the more land farmed the fewer will be the game. Domestic animals add to the food supply, but generally they play a minor part. Often they are kept for ceremonial performances, and are eaten only in connexion with sacrifices, etc.

WINNOWING BY HAND AND WIND. From earliest times man has used the wind to separate the chaff from the threshed grain. These peasants in Kathiawara, India are using baskets as "winnowing fans" virtually identical with those in use in Homeric times and in Egypt some 3,000 years B.C.

Ownership of Land

"The regulation of land-holding among cultivators ranges from communal conditions substantially similar to those obtaining among many food-gatherers, to the development of feudal tenures and private property," says Professor Daryll Forde. But among digging-stick and hoe peoples there is rarely individual ownership- land is often plentiful and because its fertility is rapidly exhausted it is of little economic value in itself.

Normally, tracts of land are held by social groups—families, larger bodies of kinsfolk, or villages. All members of the group have the right to land for farming, and once an individual has cleared a patch he retains the right to its use so long as it bears his crops ; then it reverts to the group. Only with the permission of the group can it be sold or mortgaged, and often disposal of the land in this way is unthinkable. Such economies usually have no individual

landowners ; though there may have been, in Polynesia, a landed nobility for whom the commoners worked. Once ploughing, manuring, and irrigation are adopted, continuous farming of larger areas becomes practicable and land itself begins to acquire real value. This applies especially when permanent cash crops such as rubber and cocoa are introduced.

Generally speaking, cultivators have a greater opportunity (for reasons already given) than food gatherers for developing culture and social organization. But in less favourable conditions cultivators may live in smaller-scale communities and have a less complex culture and social structure than the most advanced food gatherers, such as the Kwakiutl of British Columbia.

Cultivators are sometimes organized into large political units, like the Negro kingdoms of Africa, some of which have more than a million people, and the Aztec and Inca civilizations of Mexico and Peru. Cultivators, in fact, are organized into many different types of society. As a group their way of life is less restricted than that of either food gatherers or pastoralists.

LESSON 4

Pastoralism

The word " pastoralism " describes the way of life of those peoples who depend almost entirely upon animal husbandry for a living. True pastoralists engage in little or no agriculture and obtain their vegetable foods by gathering, by trade, or by the subjection of cultivators ; but some peoples with a pastoral outlook find it necessary or useful to do some cultivation Meat (sometimes including blood), milk, and hides are the main products of pastoralism. Some animal species are used mainly or partly as beasts of burden or draught.

With few exceptions the domestication of animals was carried out in the Old World. The animals bred by human beings include cattle, sheep, goats, horses, donkeys, camels, reindeer, water-buffalo, pigs, dogs, and cats. The dog was the earliest domesticated animal ; it is known from the Mesolithic age in Europe, about 10,000 years ago ; in modern times only the Tasmanians, and possibly the Andaman Islanders, did not have it.

Animal Husbandry

By 3000 B.C there were domesticated sheep, goats, cattle, pigs, and donkeys in Egypt, and some of these were kept in Mesopotamia and north-west India at the same period. Not all domesticated animals are suitable for pastoralism. The pig and water-buffalo cannot move about quickly enough, and dogs and cats are never a primary source of food.

In the New World the only important native herd animals were the llama and alpaca. The llama was raised mainly as a beast of burden, though its flesh was eaten, and the alpaca supplied only wool. Both were reared as part of the settled agricultural economy of the Peruvian civilization.

Pastoralism is more restricted in its habitat than either food gathering or cultivation. In the first place it is confined to the Old World, with the solitary exception of the Navajo of the south-west of the U.S.A., who became pastoralists after the Spaniards had introduced the horse and sheep to the area. Livestock is, of course, raised in great quantities in the Americas to-day but only within the framework of a wider economy.

Cultivation versus Livestock

In the Old World pastoralism is confined to the deserts, grasslands, and tundra areas which on account of aridity or short ripening seasons are difficult for agriculture. Forested areas are unsuitable for livestock ; the temperate forests are too damp and have too little pasturage, and the tropical forests of Africa and elsewhere have the additional hazard of fly-borne and other diseases. Given suitable crops and techniques, forest lands are more productive under cultivation

The main pastoral areas are the tundra, steppes, and grasslands of Asia, the deserts of Arabia and the Sahara, the savannas of the Sudan, and the highlands of East Africa. Typical pastoral peoples include the Kazak, Kirghiz, and Kalmuck of the steppes and highlands of Central Asia, who herd all kinds of livestock ; the Beduin camel-breeders of Arabia and the Sahara ; the cattle-keeping Masai of Kenya ; the Fulani of the western Sudan ; and the northern Tungus, reindeer-herders of north-eastern Asia.

In Desert and Tundra

Some animals are more suited to particular areas than others ; the camel is at home in the desert, the reindeer in the arctic tundra. But there is never complete specialisation on one kind of animal. The Masai of Kenya have donkeys as beasts of burden, and large herds of sheep kept for their blood, milk, and meat.

The Kazak of Central Asia keep and milk cattle, goats, sheep, horses, and camels. Sheep are often pastured in herds of 1,000 or more and it is their milk, for butter and cheese,

and their wool, for felt, that are prized, rather than their meat.

Horses are kept in herds of from 15 to 50 head, each with a single stallion. A rich Kazak may have several such herds. Mares are milked for about four months after foaling, and as often as six times a day, for they give little milk at one time. Mare's milk is made into a nourishing and slightly alcoholic drink called *kumiss*, which can be stored indefinitely in leather bags.

For poorer people it is a luxury, but the wealthy may live on it during the summer to the exclusion of practically everything else. Pastoralists are often more limited in their diet than food gatherers. A Beduin can live for several months on camel's milk alone.

Pastoral peoples are generally thought of as being nomadic, and it is true that they do tend to move about over considerable distances. But with the possible exception of some desert camel-breeders they wander only within well-defined territories which belong to social groups such as lineages, clans, or tribes, and frequently they have permanent sites to which they return at certain seasons.

EXTRA PROTEIN. This Nuer is supplementing his milk and millet diet with crocodile flesh cooked in a clay vessel set on a heap of smouldering wood chips and heated stones.

Nomadic Movements

Movements depend always upon the condition of pasturage, and as most pastoralists live in regions of deficient and only seasonal rainfall they may have to travel great distances to find adequate supplies. For example, during the winter the Kazak live in huts built mainly of turf, in deep river valleys where there is some pasturage ; there the herds are protected by belts of woodland from the icy winds of central Asia. Each site is claimed by a particular clan, a group of families related to each other in the male line. For the rest of the year all pastures are open to those who get there first.

In mid-April each Kazak household takes its tent and sets off to find pastures. At first there is little grass, and migrations are frequent. The rains of late spring and early summer bring improvements and allow greater concentrations of households over longer periods. But the hot sun soon parches the grass and the households are forced to split up again and move about rapidly. September brings more rain and another period of slower movements.

In October the weather begins to get cold and the herders hasten to their winter quarters. During the year each Kazak household may have travelled 500 miles, and summer and winter settlements may be 200 miles apart. In contrast, the Kalmuck of the Altai mountains of the same general area are blessed with good pastures throughout the year and can live in semi-permanent villages.

Among pastoral peoples great social value is often attached to livestock. This is particularly so with the cattle-keeping peoples of Africa south of the Sahara. The Masai of Kenya despise all cultivators In the past they have frequently driven cultivators from their lands, but they themselves would never dream of cultivating.

In contrast, the Nuer of the Sudan, whose herds have been decimated since the 19th century by rinderpest and other epidemics, have had to supplement their food supply by extensive millet cultivation. But their life and sentiments still centre on their cattle.

The men of the Nuer are herdsmen, the women dairymaids, and most of their conversation concerns cattle. Their language contains a great variety of words describing the colour patterns of cattle, and men take nicknames derived from the colours of their favourite oxen. Cattle are their wealth, and the passing of cattle from the husband's family to that of the bride is essential for a valid marriage ; it determines the legal status of the offspring.

Arbiters in Disputes

Their social organization their sub-divisions into tribes, lineages, and clans—is associated with ownership of pastures, and the only people with any kind of political authority are arbiters in disputes over cattle. Cattle are sacrificed in their rituals and are the channel of contact with lineage spirits ; they are, in fact, very rarely eaten except on ritual occasions. The extreme social value attached to cattle by many peoples of S. and E. Africa has led ethnographers to speak of a "cattle complex."

On the borders between pastoral and

cultivating peoples conflict often occurs over rights to land. In some areas it is possible for both groups to live together. The Fulani of Northern Nigeria, for example, move about among the sedentary Hausa and other cultivators and the two groups are interdependent economically.

Pastoralists as Conquerors

Elsewhere, at different periods, pastoralists have subjugated sedentary peoples. In warfare their mobility gives the pastoralists a decided advantage when they are well led, and they have more to gain and less to lose by fighting, though they have not always been successful. In eastern Africa among such peoples as the Banyankole the pastoralists who came from the north conquered the agriculturists who were of a different race and settled down among them as a superior caste of rulers

In Ruanda-Urundi there are three castes: herders (who number about 150,000 out of a total of 1,500,000), cultivators, and hunters. The powerful kings and chiefs of this area own large herds of cattle cared for by pastoral freemen who live almost entirely on milk, while the cultivators raise millet and bananas and supply their conquerors with millet for brewing beer. The classes are kept apart by certain ceremonial observances, and the pastoralists reserve all political power to themselves.

Farther south the fusion of herders and cultivators is complete and there is no class division. There men are the herders, most of the cultivation being in the hands of women. As among the Nuer, cattle have a high ceremonial and religious value and there is an elaborate bride-price system based on the transfer of beasts. Indeed, the social value of the cattle outweighs their economic value; numbers are more important than quality, and they play a minor role in the food supply.

The conservatism of pastoral peoples does not prevent them from settling down as cultivators in certain conditions, and they show a great variety of adjustments to circumstances. The Islamic Fulani of the western Sudan conducted a holy war during the 19th century and installed themselves as rulers over the emirates of northern Nigeria.

But gradually the noble families have cut themselves off from their herding cousins and have intermarried with the Hausa, adopting their town-dwelling way of life. Those who have remained herders have safeguarded their identity by emphasising their racial and cultural differences.

LESSON 5

Work, Trade, and Wealth in Primitive Societies

This Lesson and the next are concerned with some aspects of the economics of primitive societies - with the way in which they organize the production, distribution, and consumption of goods and services

In every society tasks are apportioned on the basis of age and sex. Women are the childbearers and their movements are restricted by the care they give to their children. The most active pursuits such as hunting, sea-fishing, etc., are nearly always male occupations, while household duties usually fall to the woman's lot. Among the Eskimo, co-operation between a man and a woman is absolutely necessary. The men hunt and fish and perform other tasks which demand long absence from home, while the women cook, dress skins, collect and trap—jobs which do not take them from their children.

CHINESE "CASH." These are small circular copper coins with a square hole in the middle. This Chinaman is carrying about thirty shillings' worth.

But much sexual division of labour cannot be explained in purely biological terms. Every society has its own notions, derived from its history and culture, of what constitutes woman's work. House-building, in most societies a male concern, among the Hopi of Arizona is performed mainly by the women.

Yoruba men of Nigeria weave narrow strips of cloth on horizontal looms, while the women produce wider strips on upright looms. Pottery is nearly everywhere the work of one sex or the other, rarely of both. None of these instances can be explained by differences in strength, skill, or intelligence between the sexes.

The division of labour by age springs more obviously from biological factors. The child has neither the strength nor the skill to perform the most important tasks in any society; the

old lose their vigour. Thus the most active operations are usually the work of the mature adults, while the aged, with their superior experience, advise and supervise. Generally the aged are respected and cared for; but in some circumstances it may be impossible to support unproductive individuals. The Eskimo sometimes leave the old people to die.

Ritual Specialists

Apart from sex and age, two other main factors are linked with the division of labour. First, there is the relation between the division of labour and the complexity of techniques. In the simplest food-gathering societies all people of the same age and sex can perform the tasks appropriate to them, though, of course, with varying efficiency, and there is little need of specialisation. There may be ritual specialists such as priests, magicians, and diviners, but normally these have to make their own living in the same way as the rest.

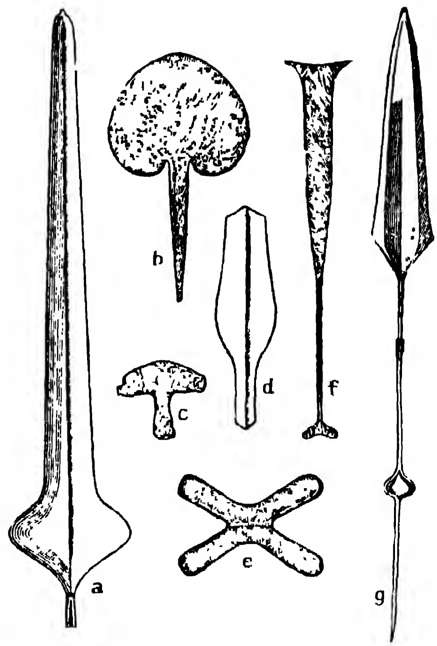
Any Australian aborigine adult male can make a stone cutting-tool, for he has learnt the art from his father or elder brother; nor is the technique so complicated that he requires assistance But iron-working is always a specialised occupation, for it requires training to be an efficient smith, and is time-consuming work. In some parts of Africa south of the Sahara the smiths are a people set apart, a hereditary guild or even a caste which does not intermarry with the rest of the society. The more complex the techniques the more division of labour there is likely to be.

Group Co-operation

The second factor is the production of a surplus of food and other basic necessities, for if people are to be withdrawn from subsistence production they must be supported by the community. Where a difficult environment, poor resources, and undeveloped techniques prevent the achievement of a surplus, one does not expect to find specialist occupations.

The complexity of techniques and the division of labour are connected with types of social organization in a broad sense. In the simplest food-gathering societies there may be little need of co-operation beyond the family, and this is true also of some agricultural and pastoral societies. Even among food gatherers the co-operation of a larger group may sometimes be advantageous.

The Plains Indians tribes which congregate in the summer for mass bison-hunts are an example Dependence upon a wider group for economic co-operation presupposes some allegiance to it, and the group comes to have significance apart from its economic activities. Where there are specialist individuals or groups social relations are likely to be more complicated than where all perform the same tasks, for the unit of interdependence is wider.



AFRICAN CURRENCIES. (a) Spear-head. Upper Congo; (b) and (c) Hoe-blades, Upper Nile; (d) Axe-blade, Stanley Falls; (e) Copper saltire, Urua; (f) Knife-blade, Sierra Leone; (g) Spear, Lomami river.

The production of an economic surplus and the division of labour are of importance in connexion with exchange of goods and services. If, as among the Semang and Eskimo, the family consumes what it produces, there is unlikely to be any internal trade. Moreover, there is little encouragement for the family to produce more than it needs, even if environmental and technological conditions will allow. Lack of internal trade is not confined to food-gatherers

The Hopi, for example, are digging-stick cultivators who produce very little exchangeable surplus. The family grows its own food, builds its own houses, and manufactures its clothes and implements. If through crop failure or other misfortune a family fails to support itself the solution lies not in buying from others but in gifts from relatives. In societies of this kind, sharing on a reciprocal basis plays a more important part than trade in the distribution of goods and services.

The absence of a true division of labour and of internal trade does not necessarily mean that there are no mechanisms for the distribution of goods and services. This is often achieved through what are called gift-exchanges and (as explained in the next Lesson) these need not be

directed merely towards the attainment of material satisfactions. For giving presents is, in many societies, the way of creating and cementing social relationships. Gift-exchanges frequently take place on such occasions as birth, marriage, death, and religious ceremonials, and they are a common feature of such relationships as those between in-laws and between subject and chief.

In Ontong Java no marriage is valid unless there is an elaborate exchange of gifts between the families of the mother and father of the bride and the mother and father of the groom. Among Bantu and other cattle-keepers of Africa, where cattle are the only acceptable bride-price these are continually distributed and re-distributed in this way.

Congo Pygmies

Even when there is no trading within a society the latter usually has some trading contacts with other societies, for differing resources and techniques result in a division of labour on a tribal basis. Even the generally self-sufficient Hopi exchange what little extra food they can produce for beads, deerskins, and other products of near-by peoples. In the Trobriand Islands of Melanesia inland and coastal tribes exchange their respective marine and garden produce.

An interesting relationship exists between the Pygmies of the Congo and their neighbours, the Negro cultivators. The Pygmies supply the Negroes with meat, hides, and other collectors' produce, and act as their spies and scouts in return for cultivated fruit and iron tools and weapons. They conduct their exchanges by *silent trade*, each group leaving its produce in an appointed place for the other to pick up. In Ruanda-Urundi this interdependence goes further; pastoralists, cultivators, and hunters all engage in silent trade.

In all instances where exchanged goods are small in quantity, organized markets and a monetary system are generally lacking and it would be more correct to speak of *barter* than of trade.

Travelling Merchants

A complicated system of trading was in operation among the Aztecs of Mexico before the Spanish conquest of 1521. Equipped with only stone tools, but in a very favourable environment, the Aztecs managed to produce a large economic surplus and to free many people for specialised occupations. There were woodcarvers, masons, carpenters, weavers, goldsmiths, merchants, priests, government officials, etc. Each city of the Aztec empire had its own market, in which there were places for each kind of merchandise—similar in many respects to the markets in some West African towns to-day.

A special group of travelling merchants who formed a closed guild with their own insignia, officers, gods, ceremonies, and laws, linked the market of the capital with those of the other cities inside and outside the empire. They were protected from injury by the government, and interference with them generally provoked warfare.

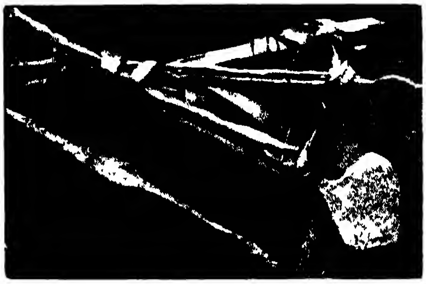
When goods are disposed of in considerable volume some standard of value and medium of exchange is necessary. In different parts of

OPEN-AIR MARKET IN NORTH BORNEO. The calm of Sunday morning seems to pervade this fruit and vegetable market at Tauren, North Borneo. The women dressed in black are of the Duson tribe. Unhurried bargaining is the keynote of all local transactions.

TOKEN MONEY. Fish hook currency in islands off Alaska was a utilitarian method of exchange and hardly suitable for the pocket.
From the Zerbe Collection

the world such objects as coconuts, shells, hoes, spear-heads, fish hooks, pigs, and feathers have served this purpose.

In the simplest societies, where small groups consume what they produce, one does not expect to find great variations in property and wealth. Among such peoples as the Semang and the Hopi there is neither propertied class, landless labourer, nor capitalist. This does not mean, however, that these people are living in a state of primitive communism. In every society there are well-defined rights to property of some kind. Even the Semang own their implements and durian trees individually.



Primitive African currency in the shape of crudely formed (and useless) weapons.

Where there are few material possessions what has been called "incorporeal property" may still be important. Names, songs, dances, and emblems may be owned by individuals or groups who have the sole right to use them. Some of the Plains Indians acquired songs, or ability to cure certain illnesses, through visionary experiences, and on occasion sold them for more tangible possessions.

When a considerable economic surplus is produced the opportunity arises for some people to acquire more than others, and it seems to be only in these circumstances that economic classes, social ranks, and real political power emerge.

Among the Aztecs there were three social classes. The upper class were "lords," titled by the king for services to the state in trade, warfare, politics, or religion. They were granted freedom from taxation and given a share in tribute collected from vassal states, and portions of the land of conquered territories. Along with these greater opportunities to secure wealth went greater political power.

In states of the West Coast and other parts of Africa political power and rank give rights to collect tribute, paid in return for protection and other advantages of belonging to an organized state, and sometimes special trading privileges. In the kingdom of Benin the king had the first right to trade with European ships, and a monopoly of certain exports. He was followed by high-ranking chiefs, and only when they had got what they wanted were ordinary people allowed to buy and sell.

LESSON 6

The Kula and the Potlatch

For the sake of simplicity it was largely assumed in the preceding Lesson that the purpose of economic activity is the satisfaction of material wants. This is always an important factor, of course, but it cannot explain all the varied forms of economic activity that are found in human societies.

Different peoples have different attitudes to work, leisure, trade, property, and wealth. In primitive societies where there is no system of wage-labour, no capitalism, and no large-scale industrialism, economic relations are generally conducted on a much more personal basis than in our own society.

Face-to-face relationships play a much bigger part. Work is often performed as a duty to a relative, friend, or chief. Food is not merely a means of satisfying hunger but a means of maintaining social relations between individuals and groups; it is used to fulfil obligations to kinsfolk, rulers, and the gods and spirits.

In many tribes a large proportion of the total distribution of goods and services is made through gift-exchanges on the occasion of marriages, funerals, religious ceremonies, and similar events. Not only the accumulation of wealth but its redistribution and in some cases even its reckless destruction may be the path to honour, prestige, and power.

Perhaps the most fascinating example of gift-exchange is that described by Professor Malinowski in his book *Argonauts of the Western Pacific*. He tells how the inhabitants of islands of the south-east coast of New Guinea

undertake large organized overseas expeditions -*kulas*--whose object is the exchange of red shell necklaces for white shell bracelets. The necklaces pass clockwise, the bracelets anti-clockwise, round a circle several hundred miles in diameter and are exchanged, as they meet, according to traditional rules and often with elaborate ceremonies. They never go in the reverse direction and never stop moving for long.

A man seldom keeps one of these valuables for more than a couple of years and they usually take from two to ten years to complete the circle. The natives themselves are not aware of the whole cycle; they know only that part of it in which they are engaged

No Haggling

The exchanges take place between life-long partners, and the number of partners a man has depends upon his rank and importance, chiefs receive and pass on more than commoners. Partnership creates special obligations between the two men, who can call upon each other for support and assistance. Most men seek partnership with one or two chiefs to whom they owe special services and on whose liberality they can call, and trading partners in distant places are hosts and allies in territories which might otherwise present dangers, real or magical

Once a man has bestowed a gift he should be repaid with one of equal value. There is no indecorous haggling, for to return a poor gift would be to lose face. So if a partner has not a suitable gift at the moment he fills in time with lesser presents until the suitable one comes his way from another partner , he may solicit it with gifts of yams, pigs, bananas, pots, etc. The necklaces and bracelets are rarely worn, many of them being too big for comfort. Nor can they be considered as money ; they are not used to buy goods.

Surrounded by Magic

The kula is no ordinary trading expedition but the basis of great voyages undertaken by canoes under well-organized leadership. Each voyage is preceded by considerable preparations and is the occasion for the building of new canoes. Every operation is surrounded by magic magic to make the canoe safe, to ensure a good passage, to avoid storms, and to put partners in the right frame of mind.

Though the kula entails a considerable volume of utilitarian trade, for the islanders themselves it is this exchange of bracelets and necklaces that is paramount. Each has its own history and romance and the whole operation has an elaborate mythology. The kula has a political aspect, too. Bracelets and necklaces are stores of value, and the local chief is the " tribal banker."

Only he can accumulate large quantities of food and convert them into these objects. It is calculated that 80 per cent. of the kula valuables are in chiefs' hands. Such wealth gives them command over tribal enterprises and over individuals who in order to obtain bracelets and necklaces become the chiefs' clients

Ravens and Eagles

An institution which at first sight is even more bizarre is the *potlatch*, which occurs among tribes of the north-west coast of America, including the Haida of the Queen Charlotte Islands. The Haida are divided into two halves or moities called Ravens and Eagles, each of which is exogamous ; that is to say, a Raven man must always marry an Eagle woman, and vice versa

A child always belongs to the moiety of its mother. Each moiety is divided into about 20 clans, and, in general, each clan owns a village containing up to 30 households. The clan chief, who is the richest and most powerful household head, holds his position by inheritance in the female line ; that is, he succeeds his own or his mother's brother.

Among the Haida, who believe hospitality and generosity to be the highest values, it is not the accumulation of wealth which gives prestige but its reckless and ostentatious distribution or destruction. This is done at a ceremony called the *potlatch*. There are different kinds of potlatch ; the most important is that which takes place at the building of a house.

Ritual House-warming

Before a married couple can have a house built they must work hard for several years in order to accumulate wealth, mainly in the form of blankets. A year before the potlatch is due the wife lends out the accumulated blankets and other goods to members of her clan, who must later on return them with 100 per cent. interest. The husband then goes out to invite members of his own moiety from the surrounding villages.

A dance is held in the guests' honour and they remain for a whole winter, gathering timber, carving a totem-pole, and erecting the house. There are feasts, and religious rites, and when the house is finished a day is devoted to the tattooing of the children of the hosts, and other children of the same moiety whose parents pay for the privilege.

When the day fixed for the potlatch arrives all the guests sit in order of rank in the new house. The hosts have piled up their store of copper shields, blankets, furs, carved dishes, and other property, to which have been added the goods that were loaned out, together with the interest. All these are then shared out among the visitors. The highest-ranking and those who have rendered the greatest services to the hosts get the best ; small boys may

receive a single blanket apiece. At the end of it the host and hostess are left destitute.

What do they get in return for all this? Surely there are more economical methods of building a house. The answer lies in the system of rank which prevails among these people. A potlatch gives prestige to the hostess and her clan and enhances the social status of her children.

Nobles and Commoners

The Haida have two social classes, the members of which we may call "nobles" and "commoners." A noble is simply a person whose parents have given a potlatch, and among the nobles he will rank according to the number and quality of the potlatches given. To be a commoner is disgraceful. It involves being snubbed and insulted without the right to retaliate. It prevents a man taking a seat of honour at a festival and wearing fine ornaments. He cannot become a chief, even if he stands next in line of succession.

Indeed, in order to become a chief a "noble" must himself give an extra potlatch at the funeral of his predecessor. If a man is assaulted or his goods stolen the amount of compensation he can claim depends on the potlatch record of his parents. The main motive behind this strange custom then, seems to be the desire of parents to do something for their children.

Face Lost for Ever

A man who has been publicly humiliated or insulted may give a potlatch in order to wipe out the memory of the incident or to throw shame on his enemy; if the latter is unable to give an equally large potlatch he will lose face for ever. In potlatches of this kind the property is destroyed, often in ever-increasing amounts. Chiefs compete in ever-larger potlatches to determine their relative ranks.

The potlatch can be understood only if one knows about the ranking system of the Haida and their conception of honour and prestige. It must have an important economic effect on the society: that of encouraging industry and trade in order to produce the necessary goods for distribution and destruction.

LESSON 7

Sex and Age Groupings

In all societies human beings are organized into groups on the basis of such principles as sex, age, kinship, and locality. A division of labour between the sexes is a fundamental feature; and apart from the work which is apportioned to them women are divided off from men in dress, name, and the behaviour expected of them.

It frequently happens that women are excluded from certain activities—political, religious, etc.; here the sexes may be thought of as forming separate groups. Among the Chacobo of Bolivia men spend most of their time in a dormitory which the women sweep each morning but otherwise avoid. Both single and married men sleep there, and there they meet to talk and drink, weave baskets and make implements.

Seclusion in the Bush

In West Africa, Australia, Melanesia, and some parts of the New World, the men are initiated into more formally organized societies. The Poro society of some Liberian and Sierra Leone tribes is an example. All male youths are initiated into the Poro during a long period of seclusion in the bush, where they are taught obedience to their elders, the long established customs and manners of the tribe, and the guarded secrets which men hold from women. It is an interesting fact that in places as far apart as West Africa, Australia, Papua, and South America, the same kind of instrument is used for frightening and keeping away women when men's societies are performing their secret rites. This is the "bull-roarer," a flat piece of wood on the end of a string: when whirled round in the air it makes a terrifying noise.

Sanction Against Menfolk

In some instances the women have a counterpart organization. In Liberia there is the Sande society. Young girls are secluded in the bush for a time to learn their tasks and the secrets, magical and otherwise, which women hold from men.

But such a rigid division of the sexes is by no means universal in primitive societies. Tribal societies often welcome both sexes on terms of more or less equality. Even where women are excluded from the most important political and ritual offices they exert a by no means negligible influence in tribal affairs.

Urhobo women of southern Nigeria have one powerful sanction which they can use against their menfolk: if they are denied what they believe to be their rights they may pack their belongings and go off in a body, leaving the men to look after themselves. Such action is said to have speedy effects.

Sometimes formal groups are organized on an age basis. Among the Edo of Nigeria the

SOUTH SEAS RITUAL DANCERS. The Baining tribe of the Gazelle peninsula, New Britain, wear these decorated tree bark hats in a dance believed to have favourable effects on the weather and other conditions.

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BALI RICE STORE. The staple food of the Balinese of Indonesia is rice, and so highly is it valued that it is stored in decorated holders raised on finely carved basalt pedestals

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male population is organized into three *age-grades* on a village-wide basis. The first grade consists of youths from their early teens to their late 20s. They perform such communal tasks as sweeping village streets, clearing farm-paths, and repairing shrines.

Adult men form the middle grade. They help the youths in the heavier communal labours, and formerly they provided a fighting force for attack and defence, and a police force for keeping law and order within the village. The senior grade of elders performs governmental and judicial functions. Headed by the oldest man of all, the elders fix dates for village festivals and other activities, carry out the sacrifices to the village ancestors, settle disputes, and punish crimes; they are exempt from all communal manual labour.

Warrior Age-Grade

An *age-set*, as distinct from an *age-grade*, is a group of individuals who pass through the age-grades together. They may have a common name and insignia and they will continue their close association throughout life. An interesting age-set system occurs among the Nandi of East Africa. The Nandi age-sets (or their names) are cyclical. There are seven of them, and each lasts 15 years, so it is over 100 years before the same name comes round again.

A youth is initiated into the age-set next but one after that of his father. When a new set is formed initiations continue for the first four years, the initiates undergoing circumcision and other rites and privations.

Eleven years later the age-set as a whole enters the warrior age-grade. So if a man is circumcised at about 18 he may become a warrior at about 30. With his age-mates he will stay in that grade for another 15 years; then, by a ceremony called "strangling the bull," they will hand over to the next age-set and themselves retire into elderhood.

At Each Stage of Life

This kind of age-grade and age-set system defines the behaviour, activities, and attitudes which should be characteristic of every Nandi at each stage in life. When a youth is initiated into an age-set he is taught the warrior values of the society, though at this time he will be only a cow-herder. When his time of warriorhood has passed he takes on responsibility, with his age-mates, for the government of the tribe.

In a society where age is of great importance in determining social status, age-set membership defines a man's position relative to those junior and senior to him. Within the age-sets there is strong solidarity as against the rest of the society. Age-mates are always expected to give each other hospitality even to the extent of lending each other their wives. And solidarity within the warrior-group is no doubt of immense importance to a war-like tribe. Among some peoples there are parallel age grades and sets for women.

LESSON 8

Kinship and Marriage

KINSHIP plays a much bigger part in the life of many peoples than it does in our own, and anthropologists have devoted much time to the study of it. When we say that two people are *kin* we mean either that one is descended from the other or that they have a common ancestor or ancestress.

Kinship arises from a series of parent-child relationships. The whole network of kinship relations in a society is its *kinship system.* In some societies kinship relations are recognized over such a wide range that a person never comes into contact with a non-relative in his life.

A second set of relationships is established through marriage. These are called *affinal* relations; any person with whom we can trace a connexion through marriage is our *affine*. All kinship relations have their basis in the elementary family, the group consisting of a man and his wife and children, and this is brought into existence through a marriage.

The essential difference between marriage and other unions between a man and a woman is that, in the words of Professor Radcliffe Brown, it is "a social arrangement by which a child is given a legitimate position in the society, determined by parenthood in the social sense." Though biological parenthood and social parenthood frequently coincide this is not invariably so. Even in our own society parenthood may be by adoption. In some African tribes, once a man has paid the bride-price on a girl any offspring she bears belong to him whether he is their real father or not. In Dahomey, and elsewhere, even a woman may be recognized as the "father" of children, she does this by going through a form of marriage with another woman who takes a lover in order to produce children for her. She may do this if, for instance, she cannot have children herself.

It is necessary to make a distinction between the social father or *pater* and the biological father or *genitor* even though in most cases they are the same person. That the concept of "father" is a social one among some of the Australian aborigines is shown by the fact that

they are said not to understand the part played by the male in the procreation of a child.

Whenever such words as "parenthood," "kinship," and "descent" are used in these Lessons, reference is being made primarily to social relationships, not necessarily to biological ones.

Rights of Marriage

The first function of marriage is the production and rearing of legitimate children. Although marriage partners are invariably accorded certain sexual rights over each other, and although these undoubtedly consolidate the relationship, the primary motive for marriage can hardly be the gratification of sexual desires. Among the Polynesians both sexes can enter into sexual relationships before marriage without censure, but they still marry in order to found a family and perpetuate a lineage. Nor do all societies forbid extra-marital relations.

Generally speaking, men are allowed more freedom than women in these matters. Among the Eskimo men may "lend" their wives to each other as a gesture of friendship, and among the Shoshoni Indians of North America a man might allow his younger brother to cohabit with his wife in his absence. The Sherente of Brazil are brought up to fear the sexual relationships to such an extent that they enter into marriage only with reluctance and shyness.

Economic Co-operation

Another universal function of the marriage tie is to create a unit of economic co-operation between a man and a woman. An earlier Lesson recorded that every society has its own ideas of what is woman's work and what is man's, and usually it is shameful for a person of one sex to have to do the work of the other. Among the Eskimo life may be impossible without such co-operation. The Eskimo, in his difficult environment, must spend all his time hunting and fishing and he must have a woman to cook for him, dress skins, and make his clothing

Monogamy is the condition in which one man is married to one woman. *Polygamy* has two forms: *polygyny*, where a man has more than one wife, and *polyandry*, where a woman has two or more husbands. Monogamy is the commonest condition everywhere, but not all peoples practise it on principle. Most peoples regard polygyny or polyandry as the ideal state. The number of spouses a man may have may be limited legally (as in Islamic societies, where the maximum is four), or the limits may be set by economic factors and the number of women available.

Surplus of Women

Nature seems to ensure that in all communities equal numbers of male and female children are born. But there is often a higher mortality rate among boys, and warfare and other dangerous male pursuits may combine to produce a surplus of women.

Where marriage and offspring are all-important for a woman's status and for the perpetuation of the group, polygyny seems to be the natural answer to this state of affairs. But the ratio between the sexes is never so great as to allow every man to have two wives.

Where polygyny is much desired one solution is to make the marriage age of females much lower than that of males. Among the Murngin of Australia, where the middle-aged men generally have three or more wives, young men often have to wait until they inherit a wife from a deceased relative. In most polygynous societies, in fact, it is only the older, wealthier, or higher-ranking men who can afford a plurality of wives, and number of wives often confers prestige. Some African kings have several hundred wives living in highly-organized harems.

It is impossible to give one satisfactory reason for the practice of polygyny. The Yoruba of Nigeria have a number of motives for seeking more than one wife. In the past, warfare removed some of the men of marriageable age.

POLYGYNY ON THE CONGO. This African chief had more than 100 wives. The two principal wives, of blood royal, stand in full state dress immediately behind his chair.

Then again, Yoruba men love to have many children, and in view of the high infant mortality rate and the possibility of barrenness it is safer for a man to have a number of wives.

The rule that a man should not cohabit with his wife while she is nursing a child is another inducement to marry a second time. Wives are a good economic investment, too, for the Yoruba women are great traders and additional income can be earned in this way.

Great Prestige

As is the case with other African peoples the Yoruba pay great attention to rank, and a chief or king is expected to have more wives than a commoner. As in latter-day Europe, marriage can be a means of cementing political alliances. The possession of many wives and many descendants can create a following which may lead to great prestige and a rise in rank. A man may acquire an extra wife by inheritance from a dead kinsman, and it is his duty to look after her and give her the children which she always desires. Where women are brought up to recognize polygyny as the natural state they do not resent it as others would. Jealousy and quarrelling between co-wives do sometimes occur, and most peoples make arrangements to prevent these becoming too serious. Co-wives are often given separate houses or apartments. The senior wife may have authority over the others and the duty of settling disputes between them, but each enjoys a degree of independence.

BADGE OF POLYANDRY. In Tibet, where polyandry is an established custom among some of the hill tribes, the woman who has more than one husband wears this distinctive head-dress, made of wool and cane.

Among the Edo of Nigeria a man divides his yam-farm into plots, on each of which one wife plants subsidiary crops for her own use and profit. Established wives in that society may persuade the husband to acquire a new wife to help with the triple burden of being farmer, trader, and housewife at the same time. Many Edo women would say that it is better to be the second wife of a " big man " than the only wife of a poor man.

Toy Bow and Arrow

Sororal polygyny, in which a man marries two sisters, is an arrangement believed, in some societies, to lessen the danger of conflict. Among the Crow Indians of North America co-wives who are sisters live in the same house, while unrelated wives occupy separate houses.

Very few societies practise polyandry as the prevalent form of marriage. The best example is found among the Todas of southern India, where the practice can be explained by a preponderance of males due to the custom of female infanticide. There, two or more brothers or friends agree to marry the same woman.

If the husbands are brothers (this custom is called *adelphic polyandry*) they live in the same house but otherwise separately, being visited in turn by the wife. Any child of the marriage belongs legally to the husband who has last performed the ritual of presenting the wife with a toy bow and arrow.

It has sometimes been suggested that *group marriage*, in which a number of husbands shared a number of wives, must have been the original form of marriage. But there are no well-documented examples of this except among the Toda, where it developed after the British had forbidden female infanticide. Among some of the Australian peoples and the Chukchi of Siberia men do share sexual partners, but the recognition of sexual rights over a woman does not in itself constitute marriage.

In our own society marriage is often regarded as an event affecting primarily the couple concerned, the state, and perhaps some church. This is not true of all societies. Many peoples regard it as a contract between two bodies of kinsfolk, both of which have great interest in its outcome.

It is not unreasonable that they do not leave marriage to the free choice of the spouses. Marriage, in fact, is often arranged by kinsfolk on one or both sides and validated by *marriage payments* or the exchange of gifts between the bride's kin and those of the groom. In some African societies a man can acquire a bride only by transferring cattle to her father. Contribution to this payment may come from a wide circle of kin on the man's side and the cattle are shared by an equally wide circle on the woman's side.

Wife Not For Sale

It would be a mistake, however, to think of the man as buying his wife. He does not gain unrestricted rights over her, nor is she a chattel ; he cannot sell her to someone else. Nor do these payments lower her status. Among the Yurok of California the husband, wife, and children all gain considerable prestige from a large marriage payment.

Marriage payments must be considered from several points of view. In one sense they represent compensation to the bride's kinsfolk for the loss of certain rights over her. In some African tribes the cattle acquired through the

loss of a daughter is used to obtain a wife for her brother. When a man pays for his wife he acquires the right to certain services from her economic and otherwise. Not least among these is his expectation that she will bear children for him.

Among some Bantu peoples if a wife proves barren the marriage payment may be returned or another wife substituted. The extent of the rights which a man acquires over his wife's offspring depends upon the degree to which the kinship system leans to patrilineal or matrilineal descent, but in any case the payment validates the union and legitimises the children. Just as the wife has certain obligations towards her husband so he must care for her and treat her in the fashion approved by the society.

MARRIAGE BY PURCHASE. In this photograph a young Zulu brave is bringing his bridal gift of cattle to his future father-in-law just before the wedding. The animals are held in trust for the bride in case she should be made a widow, or to compensate her relatives should she run away.

An interesting sidelight on marriage-payments is afforded by such peoples as the Ijaw and Northern Edo of Nigeria and some societies of the Malay Archipelago. These have two varieties of marriage, depending on the amount of the marriage payment. A large payment binds any offspring of the union to the father's kin, while a small payment ensures either that they belong to the mother's side or that they are shared between the two groups. An Edo man who has no sons may prefer to marry his daughter in the latter way so that she may give him an heir and successor, and so that his name will be remembered.

Marriage payments certainly are a means of cementing alliances between two groups of people and maintaining the stability of marriages. A father is unlikely to assist a daughter to break up her marriage if it means that he will have to return a large number of cattle.

Breach of Prohibitions

All human societies forbid sexual relations between persons related within certain degrees. The English Book of Common Prayer, for example, gives a list of relatives whom it is forbidden to marry.

Some peoples make a distinction, in this respect, between marriage and extra-marital relations, the latter being tolerated where the former is forbidden, but for the present this distinction can be ignored. *Incest* is the breach of prohibitions upon sexual relations within the forbidden degrees, but incest regulations differ from society to society ; what is incest for one may be the normal state of affairs for another.

There have been numerous theories to explain why incest regulations exist. Some people have suggested that the purpose is to avoid the dangers of close interbreeding ; others have said that people who grow up together do not feel sexual desires for each other ; others have regarded the avoidance of incest as instinctive. None of these theories fits the facts.

The study of genetics has shown that inbreeding is as likely to bring out desirable as undesirable traits, a fact that has been put to good effect in plant and animal breeding. Moreover, peoples like the Arunta of Australia, and the Trobriand Islanders, are unaware that the male plays any part in begetting a child, but these groups, like any others, have incest regulations. The second theory is contradicted by criminological evidence from our own society, and the third would seem to make incest regulations unnecessary.

Moreover, none of these theories can explain the great variety of incest rules in different societies. It is true that all peoples prohibit parent-child sexual relations and nearly all those between full brothers and sisters—exceptions being the royal families of ancient Egypt, Peru, and Hawaii. Marriage between any other two relatives, however, is permitted in at least one or two societies.

Avoidance of Rivalry

Among some of the Northern Edo of Nigeria a man can marry his half-sister by the same father, among the Marquesans his paternal aunt, among the Bali his sister's daughter. There are several tribes where a man is allowed to marry his own grand-daughter.

A more satisfactory theory of incest regulations is that they arise from a need to avoid sexual rivalries within the family, for these would reduce its usefulness as a group. The extension of these rules beyond the immediate family may perhaps be explained by the

tendency to identify certain kinds of relatives with each other. The sexual attitudes appropriate to the mother may be extended to her sister, for example.

Numerous societies use the same kinship terms to cover a large number of relatives—all the mother's sisters and even the latter's daughters may be called "mother," and the father's brothers and their sons "father"—and there is a tendency to extend incest prohibitions along the same lines, in any particular society.

Rules of Exogamy

As noted in p. 583, certain categories of kinsfolk may combine to form social groups such as a lineage or clan. Generally speaking it is forbidden to marry within such groups; that is to say, they are *exogamous*. The narrower the range of a lineage the more strict are the rules of exogamy likely to be. Among the Tallensi of the Gold Coast marriage within the maximal lineage would not be so serious as within the medial lineage (*see* p. 584). However, each society has its own ideas about these matters. Some societies forbid marriage between any two people related in any way whatsoever.

The function of lineage and clan exogamy can be explained along the same lines as the prohibition of sexual relations within the family. It eliminates intra-group rivalries and thus promotes solidarity. But it is of wider significance for the society as a whole: by forcing men to seek their mates outside their own lineage or clan it creates ties between different groups.

By ensuring the circulation of women it sets up a network of social and economic relations cutting across those which bind people together through common descent. Exogamy, too, may be practised by local groups irrespective of kin ties. A whole ward or village of the Edo of Nigeria may be exogamous; the effect is the same.

Cross-Cousin Marriage

Just as marriage is forbidden between certain kinsfolk so some peoples prescribe marriages between people related to each other in specified ways. There is no general explanation of such preferential marriages; each has to be accounted on its own merits.

One of the commonest examples is *cross-cousin marriage*—marriage with the mother's brother's daughter or the father's sister's daughter. The precise significance of cross-cousin marriage varies from tribe to tribe, according to the descent system and other factors.

As noted, marriage is an alliance between groups as well as a union between individuals. When a cross-cousin marriage takes place there is a renewal of alliance between groups which are already connected by affinal ties. The process of adjustment may thus be easier and the basis for co-operation more solid. The same may be said of the custom whereby a Miwok man marries his wife's brother's daughter. The Miwok are patrilineal and thus the man's second wife comes from the same patrilineage (*see* p. 583), as his first.

Wandering Beduins

Marriage with parallel cousins (father's brother's daughter, or mother's sister's daughter) is much rarer, but an example of the first is provided by the Beduin of Arabia. The Beduins wander about seeking water and pasturage, in bands which have a core of patrilineally related men. A band must be strong, to protect itself against other bands, and it is desirable that young men should remain in it when they marry. In these circumstances a young man will marry his father's brother's daughter. The solidarity of the band is thus maintained, and indeed increased, for kinship ties are reinforced by affinal ties.

Another prescribed marriage is the *levirate*. Here custom requires a man to marry the widow or widows of his deceased brother.

CHILD MARRIAGE IN INDIA. Here a child bride in what was then the Madras presidency is sharing her wedding meal with her tall bridegroom on her left; on her right hand is her small brother who has just been married to the small girl standing behind him. This photograph was taken just before the Child Marriage Restraint Act – prohibiting the marriage of males under the age of 18 and females under 14—came into force in 1930.

In a society such as that of the Nuer of the Sudan a wide circle of patrilineal relatives contribute to the cattle paid by a man to the father of his bride.

If the husband dies, his patrilineage still retain rights in the woman who has been married with their cattle. One of the relatives takes her over, and any children she may bear are counted as the offspring of the dead man.

Endogamy

A parallel custom, the *sororate*, requires that a widower shall marry the sister of his deceased wife. This pertains with the Chiricahua Apache of North America, a matrilineal people practising matrilocal residence. Sons-in-law are an economic asset to their wives' families, and the sororate is a way of retaining their services if death should end the original union.

Endogamy is the opposite condition to exogamy- the rule that a person should marry only *within* the group. Thus Beduin bands are usually endogamous. They provide a rare example of endogamous patrilineages. Generally, endogamy is more characteristic of classes and castes than of unilineal descent groups.

It is a device for preserving the racial or cultural separateness of a group. Indian castes are endogamous, and so are some of the pastoral peoples of East Africa who are conscious of their racial and cultural separateness from agricultural and hunting peoples.

LESSON 9

The Family

In everyday speech the word "family" may refer to the group composed of parents and children, or it may include other relatives on the father's or mother's side or both, and even relatives by marriage.

One type of group which is universal is the *elementary* or *nuclear family*, consisting of a man and his wife and their child or children. Among the Polar Eskimo, who as a result of the poverty of their resources are very scattered, the elementary family is the only social unit with real stability; only in winter do a number of such families, usually related by kinship ties, come together in a village settlement.

The Compound Family

Another type of grouping can be called the *compound family*. This is exampled in our own society when a widowed or divorced spouse brings children of his or her first marriage into the new household. In polygamous societies the death of a spouse is not necessary for the formation of a compound family. Where polygyny is permitted a man and his wives and their children constitute a compound family which is simply a collection of elementary families sharing a common father.

Each wife and her children may occupy a separate house or apartment, but all members of the family will co-operate for certain activities, economic, religious, and otherwise. In similar fashion a polyandrous compound family results where several men and their offspring share one wife and mother, as among the Toda.

Headman as Manager

The *joint family* is another type. It often happens that when young men marry they bring their wives to live in their father's house and put themselves under his authority. A joint family sometimes holds land in common and co-operates in certain matters as a group. In some areas it is the custom for men to go and live with their wives' people.

A joint family observed in Serbia consisted of a headman and his brothers, sons and grandsons, all with their wives and unmarried children or married sons and their wives and children. Grown-up daughters married out. Altogether there were 11 elementary families living together in a 21-roomed house.

The group owned a tract of land in common and co-operated in economic activities, with the headman as manager. The women specialised in cooking, spinning, weaving, and sewing, while the men, apart from one who was a shoemaker, tended livestock.

Extended Families

Groups similar to the joint family but which are split up between a number of neighbouring households are called *extended families*. In polygamous societies they may add up to several hundred people.

The composition of joint and extended families will depend partly upon where the spouses reside after marriage. Different peoples have different customs in this respect. The two most common patterns of residence are called *patrilocal* or *virilocal* (residence with the husband's people), and *matrilocal* or *uxorilocal* (residence with the wife's people). In some cases the newly-married couple will live away from either group; in that event one does not expect to find joint or extended families. Groups of young men of the Nyakusa of Nyasaland build villages at some distance from those of their fathers, though they keep close contact with them.

The Bemba of Rhodesia, who trace descent

in the female line, rule that when a man first marries he should go to live with his wife's people, putting his services at the disposal of her father, mother, or mother's brother. Later he is allowed to return with his wife and children to his own group, of which he may eventually become headman. There his own daughters and sisters will bring their husbands for the first years of married life. And so it continues. An even stranger residence pattern is common among the Haida of British Columbia, and some Congo tribes ; this is called *avunculocal residence*—residence with the uncle's group. Haida boys of ten or eleven years of age go to live with their maternal uncles, and when they marry they take their wives to join their uncle's group. If the uncle is a chief, one of his nephews may succeed him and marry his daughter. His own sisters, in turn, send their sons to him, and so the group is perpetuated.

LESSON 10

Lineage and Clan

AMONG numerous primitive peoples effective ties of kinship extend far beyond the family, uniting wider groups of people for economic, political, religious, and other activities. The most important of these larger groups are the *lineage* and the *clan*.

Membership of a lineage or clan confers certain rights upon the individual—the right to farm or build on lineage land, for example, and the right to seek economic or legal aid from the other members.

Tracing Descent

It confers obligations, too ; the obligation, perhaps, to contribute to the bride-price paid on a woman by a member, or to the compensation paid by a member who has injured someone from another lineage or clan. Most important, lineage or clan membership commonly determines inheritance of property and succession to rank and office. In any society the lineage affiliation of an individual is determined by the way in which the society traces descent.

Kinship arises through the recognition of a series of parent-child relationships. But as every legitimate child has two parents there are two ways of tracing descent : through males, and through females. The name *cognates* is given to all kin, whether their relationship is traced through males or females or both.

The cognatic principle of tracing descent is used, to some degree, in all societies ; virtually all peoples recognize kinsfolk to whom they have obligations on both the father's and mother's side. There are a few examples of peoples who tend to treat both sides equally, in most respects.

Indemnity for Murder

The Teutonic peoples of Europe had an institution called *wergild*—indemnity paid by a murderer to the kin-group of his victim. This kin-group, called a *sib*, included the victim's relatives through males and females up to a recognized degree, commonly that of fifth cousin. All these could, theoretically, claim a portion of the wergild and, conversely, would be responsible for providing it if one of their members committed murder.

Patrilineage and Matrilineage

Most societies emphasise one line of descent, through males only or through females only. The result is a *unilineal descent system*. Cognates who are related only through males are called *agnates* ; they are related *agnatically* or *patrilineally*. People related through females only are *uterine* or *matrilineal kin*.

If this terminology is applied to cousins, it is found that the father's brother's children are agnates, the mother's sister's children are uterine kin, and the father's sister's and mother's brother's children (the cross cousins) are simply cognates.

A group of people who can trace their common descent through males from a common ancestor and who act together in some way or have collective rights, constitute an *agnatic lineage* or *patrilineage*. A similar group tracing descent through females from a common ancestress is called a *matrilineage*.

Patrilineal Nucleus

The essential difference between a family and a lineage is that while the family is a residential group the lineage is primarily a descent group. Some members of the joint or extended family are related through marriage rather than kin ties, but all members of the lineage are theoretically unilineal kin.

The joint or extended family frequently has a lineage or part of a lineage as its core. In the Serbian joint family (mentioned in Lesson 9) the headman and his sons and brothers with their unmarried daughters constituted a patrilineal nucleus. Their wives came from other lineages and their daughters married into other families.

Among the Bemba the extended family has a matrilineal core consisting usually of a man and his sisters and the sisters' daughters and unmarried sons. The husbands of these women belong to other lineages, and their sons, at least

A PUEBLO INDIAN HOUSE. This range of structures, with flat roofs, and storeys arranged in terrace fashion, is a clan house belonging to, and controlled by, a woman of the clan and passing, on her death, to her eldest daughter. The beehive shaped objects in the foreground are ovens.

in the early years of marriage, live with their wives' families. While marriage changes the family membership of one or both spouses lineage membership is usually unaffected.

Among the patrilineal Edo of Nigeria the women of a lineage who have married out return each year to take part in the sacrifices to the lineage ancestors. They are still members of their father's lineage and therefore still under the protection of the lineage ancestors.

Double Descent

Occasionally both patrilineages and matrilineages are found in the same society, but in such cases they fulfil separate functions. Among the Yako of Nigeria every man belongs to both a patrilineage and a matrilineage. As a member of the former he lives in the dwelling-area associated with it, and farms on land over which it holds collective rights. But he inherits movable property through his matrilineage and it is to his uterine kin that he goes for help in time of trouble. The uterine kin can claim compensation if he is killed, and they are responsible for any debts he may leave when he dies.

Headman-Priest

Other societies have more one-sided systems. The Tallensi of the Gold Coast of West Africa are an example of a markedly patrilineal people. They trace descent through males, and marriage is patrilocal. The household commonly consists of an elderly man, his unmarried children, and his adult married sons with their families. To these are sometimes added relatives such as a widowed mother or sister. If the old man dies, the household may remain a single unit under the authority of the oldest of his sons. If the unit grows too large one of the sons may break away and found his own household and lineage.

Professor Meyer Fortes of Cambridge University was able to recognize several tiers of lineages in Tallensi society. The *inner lineage* consists of the descendants of an ancestor four to six generations back, and two or more of these lineages are formed through the splitting-up of a *medial lineage* whose founding ancestor is six to eight generations back. These in turn were formed by the segmentation of a *maximal lineage* with an ancestor eight to ten generations back.

The headman of an inner lineage has legal responsibility for its members, and he is the priest of the lineage ancestor spirits; it is within lineages of this span that the wives of the dead are inherited. A marriage can be contracted only with the consent of the headman of a medial lineage, and members of such a lineage are forbidden to marry each other.

Each lineage, of whatever span, is associated with a particular territory, the territory of a maximal lineage being divided between its component medial lineages, and so on.

Control of Children

Perhaps the most thoroughgoing example of a matrilineal descent system is provided by the Nayar of Malabar, India. All legal rights whatsoever are denied to the male parent. A young girl is married, then divorced almost immediately. She takes lovers, and any children born to her are affiliated to her matrilineage which is a local group possessing land and houses.

Few societies go so far as this towards either patriarchy or matriarchy. In many matrilineal societies there is considerable conflict between the father and the mother's brother over the control of children. It is often the case, too, that where there are strong legal ties with the mother's or father's kin-group there are more intimate ties of affection with the other side.

Other Social Arrangements

Human societies show great ingenuity in the varieties of social arrangements they invent. Thus, women of the Apinaye of Brazil trace their descent through their mothers, men through their fathers. In the Mundugumor tribe of New Guinea men are affiliated to their mother's

group, women to their father's group. The Buginese of Celebes have arranged it so that the first child goes to the mother's group, the second to the father's group, and so on alternately.

Mythical Ancestor

A clan, like a lineage, is a unilineal descent group. We can speak of *matriclan* and *patriclan*, according to which line of descent is followed. According to the most generally accepted definition, the clan differs from the lineage in that while in the lineage relationships can be actually traced, in the clan they are assumed and they are often of a mythical nature. The founding ancestor is frequently a mythical figure ; among Australian aboriginals and other peoples he may be an animal or plant species.

The Crow Indians of the Great Plains provide an example of clan organization. The Crow consist of three large politically independent bands united only by a common language and culture, a feeling that they are different from other groups and common clans. The matrilineal clans, which are exogamous (marriage within the clan forbidden), cut across the three bands. So every Crow can find in any band people whom he can treat as relatives, even though he has never seen them before.

The clans provide useful contacts between the bands which have no common government organs. Within the band, clan ties are stronger. Clan members camp and feast together, and they are always expected to give each other help, especially in conducting a feud to avenge the killing of a clansman. Vengeance might be taken not only on the murderer but on any member of his clan. Frequently clans are not local groups. They may be dispersed throughout a whole tribe.

LESSON 11

Stateless Societies

There is considerable interest in the way in which different kinds of societies govern themselves, that is, their *political organization*. When one uses these words one thinks primarily of a local group with a recognized leader or set of leaders who can command the allegiance, obedience, and respect of the members of the group, backing up their authority, if need be, by the rightful use of physical force.

The word " state " best sums up the characteristics of such a political unit. " The state," says Professor Lowie, " embraces the inhabitants of a definite area who acknowledge the legitimacy of force when applied by the individuals whom they accept as rulers or governors." The function of such rulers is to maintain orderly relations within the group and to organize its collective activities, both internal and external, as in warfare. The idea of *the political* is closely bound up with *law* and *war*.

Three Modes of Political Activity

There are three main aspects of political activity. There is *legislation* the formulation of rules of behaviour which are binding upon the group and which, in the breach, may bring down physical sanctions on the offender. There is the *judicial* aspect—the investigation and punishment of breaches of law and custom. And there is the *executive* or *administrative* aspect -the putting into effect of legislative or judicial decisions.

In our own society there are separate institutions which more or less correspond to these three modes of activity—parliament, courts of law, and the civil service—though their functions do overlap to a certain extent. In some primitive societies a chief may be, at one and the same time, a legislator, judge, and executive, as well as a military commander and priest.

Traditional Laws

The legislative function is much less important in primitive societies than it is in our own. Laws are generally traditional and have existed from time immemorial ; and although they undoubtedly do change there is no recognized instrument for adjusting them to changing circumstances.

Powerful monarchs of African states have legislated to some effect. Chaka, the Zulu king (1783-1828), abolished circumcision in his territory by royal edict. And a king of Benin, in West Africa, is said to have changed the rule of succession to the throne by ordering that every king should be succeeded by his eldest surviving son instead of by any of his close patrilineal relatives as had formerly been the case.

No Political Institutions

Some of the most simply organized societies have nothing that one can point to as being a specifically political institution or office. They are, in fact, *stateless societies*. Consider the Polar Eskimo of North Greenland, for example, who wrest a living from a very hostile environment and are thinly scattered over their habitat.

The Eskimo divide their year into three parts. During the short summer they move about in groups of one or two families, fishing and hunting caribou. These groups come together as a result of kinship ties or simply because their

members get on well together, but they have no permanence ; their composition may alter from year to year.

In the winter seven or eight elementary families come together in a village of turf and stone houses built in good hunting territory and close to supplies of food which they have laid up in the spring and summer. Within the village people are expected to be hospitable and friendly towards each other, but there are few communal activities.

Settlement of Grievances

Each family is sufficient unto itself economically, so that while a good hunter of strong personality may gain special respect there are no opportunities for him to assume permanent leadership. There are ritual specialists or *shamans* who may call the people together to perform certain rites when the food supply is poor, but their leadership does not extend beyond these occasions. In the spring, groups of families from the same or different villages hunt seals and birds and collect eggs along the coast, but once again all activities are on a family basis.

Although disputes and (rarely) even murders occur among the Polar Eskimo, there is no official mechanism for settlement and punishment. The only sanctions against bad conduct are public opinion and self-help. The victim of an offence may seek vengeance but he will not be supported by any public authority. Yet the Eskimo, perhaps because they are so fully occupied making a living, manage to live together fairly peaceably.

In some other areas persons who have grievances express them by composing and singing scandalous songs about one another. The one who gets the worst of such exchanges may find himself the object of much ridicule.

Rabbit Drive Leader

The Western Shoshoni of the Nevada Desert are almost equally devoid of anything resembling a political institution. They, too, split up during the summer into individual families which wander about collecting vegetable foods. Two to eight of these families come together in the winter, but these groupings need have no permanence from one winter to the next.

Apart from some ritual performances their only collective activity is a rabbit drive in the autumn. This is controlled by a leader chosen for his experience. His authority lasts only for the period of the drive, and no member of the group is obliged to obey him except in so far as it is in his own interests to do so.

These two societies—the Polar Eskimos and the Western Shoshoni—though inhabiting very different environments have much in common apart from their lack of political institutions. They are both food-gathering peoples, living in sparsely populated areas. Because economic activities are almost entirely confined within the family group, and because any larger groupings are unstable from year to year, there is little opportunity for the exercise of leadership.

Nor do such conditions allow for great differences in wealth which might lead to the formation of social and economic classes. Social relations within such societies as these are regulated simply on the basis of kinship and comradeship, and within the framework of a code of behaviour which is known to all and which is maintained by the force of public opinion, reciprocity, and self-help.

Peaceful Hordes

A somewhat less anarchic society is characteristic of the Australian aboriginals, who, however, still have only very rudimentary political institutions. The local unit of the Kariera—the *horde*, as it is called by Professor Radcliffe Brown—is a kinship unit, a patrilineal extended family containing up to 70 persons. The horde owns its own territory, to which it is very attached.

No horde would think of dispossessing another horde of its territory even if it defeated it in a fight. In actual fact warfare is very infrequent. Quarrels between members of different hordes may be settled by staged contests between the individuals concerned. Hordes, which are exogamous groups, are linked to each other by marriage ties.

Authority is very much restricted to the old men. They organize the group's movements and conduct its relations with other hordes. Ridicule and loss of prestige are the main sanctions against anti-social behaviour ; but in the most serious cases the elders might take action by expelling the offender.

Among other Australian tribes the elders might support the action of a party which seeks vengeance against an offender. In a case of wounding they may order the injured party to retaliate by, for example, spearing his assailant, the latter not being allowed to defend himself.

Horse-Stealing Indians

The Crow Indians of the Great Plains approached a step nearer to statehood. As already stated, they were a hunting people, but their resources and technology were such as to allow greater concentrations of population. The Crow were made up of three politically autonomous local groups or *bands* which shared a common language and culture and regarded themselves as being different from other peoples.

Warfare played a big part in their lives, though it was still on a small scale, the object of much of it being the stealing of horses.

Other fights took place to avenge the killing of one of their number during horse-raiding.

Prestige and authority were gained through success in warfare—for leading a successful raiding party, being first to strike an enemy, capturing an enemy weapon or horse, etc. Chiefs were men who had gained all of these honours. They formed a band council, and one of their number was recognized as the band chief.

It was his duty to decide upon band movements, organize raiding parties, buffalo hunts, etc. Although he should do all in his power to maintain order within the band he had little physical force at his command. His weapons were rather persuasive and, in some Plains Indians groups, the band chief even resorted to bribery to prevent conflicts.

The Crow band emerged most clearly as a truly political unit in the annual mass bison hunt. The men of each band were organized into a number of societies or associations. Each year, at the time of bison hunt, the head chief appointed one of these societies to act as "police." It was the duty of these police to prevent premature attacks on the bison herd and to confiscate game illegally obtained. They could penalise offenders by corporal punishment, the destruction of property, and even by killing them. They could exercise these rights only during the period for which they were appointed.

LESSON 12

Kinship Writ Large

AMONG such peoples as the Eskimo and Shoshoni social relations are conducted mainly on the basis of kinship. With the Kariera, too, the only local group that performs anything resembling political functions coincides with a kin-group. Kinship, or more strictly lineage organization, sometimes provides the framework for wider-scale political systems.

The Nuer of the Sudan are split up into independent tribes, most of which number more than 5,000. Each tribe has a territorial unity and exclusiveness and owns its own pastures and water-supplies , and it is divided into localised tribal sections, each of which contains a number of villages.

A man is an aristocrat in the tribe within which his clan or lineage is dominant. The Nuer have no law in the strict sense, for there is no person who has the right to decide the rights and wrongs of a dispute and to enforce his decisions. There are agreed compensations for assault, theft, and other offences ; but the only way to exact these is to persuade one's kinsmen to threaten the other party with force.

Leopard Skin Chief

The threat is usually carried out by seizing cattle from the offender or his kinsmen, who may prefer to pay up rather than risk a fight. Naturally, it is easier to obtain compensation from a close kinsman or fellow-villager than from a member of a different village. It is still more difficult to make a member of another tribal section pay up, and beyond the tribe it is impossible.

When one Nuer kills another a feud may occur. The killer may seek to avoid it by going immediately to a ritual specialist called the Leopard Skin Chief and indicating that he wants to settle the matter by compensation. The Leopard Skin Chief has no legal or political authority, but it is his duty to discover whether the kinsmen of the slayer are willing to provide the cattle necessary to compensate the kin of the victim, and to persuade the kin to accept the cattle. If he succeeds, he supervises the handing over of the cattle and performs a purificatory sacrifice. If he fails, a feud may result.

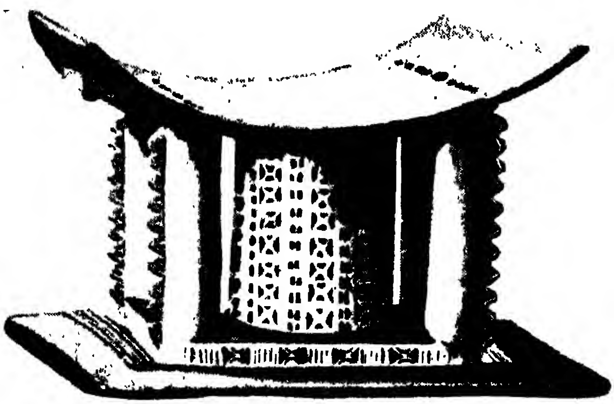
The ease with which a settlement is effected depends on how closely the parties are related and how far apart they live. If they belong to different sections of the same tribe compensation may be very difficult to obtain and a prolonged period of hostility may result. It is on this question of the feud and the possibilities of its settlement that the political system of the Nuer turns.

Supernatural Sanctions

Reference has been made to the lineage system of the Tallensi of the Gold Coast. Each Tallensi lineage and lineage segment is headed by its senior male member. These lineage heads are called *kpeem*, and all authority is vested in them. The authority of a kpeem varies inversely with the span of the lineage of which he is head. Thus the heads of the smallest units have complete ritual and moral authority, while those of the widest units, though having much respect and prestige, may have little actual control over the activities of other than members of their own segments.

No lineage head has physical sanctions at his disposal. He depends rather upon the fact that, as head of his lineage and the priest of the lineage ancestors, he can excommunicate any member of the lineage by refusing to sacrifice for him.

The ancestors are concerned with the well-being of their descendants, and to cut a man off



THE ASHANTI GOLDEN STOOL. This royal stool was brought to England after the Ashanti revolt of 1900, but was later restored to Prempeh II.

from them is to expose him to all kinds of misfortune. It is incumbent upon all the people who sacrifice to the same ancestor to behave properly towards each other so that all may benefit.

The Nuer and the Tallensi, for whom "kinship writ large" forms the framework of their total social organization, are both stateless societies, denying to their leaders any monopoly of the use of force. Kinship may play an important part, too, in more highly organized societies with kings, chiefs, and other definitely political and legal institutions.

Guardian of the Stool

The Ashanti of the Gold Coast provide an example of this kind of society. Ashanti is a federation of a number of semi-independent chiefdoms one of which is dominant in political and religious affairs. Each chiefdom consists of a capital, the seat of the *omanhene* or chief, and a number of subsidiary towns and villages. The chief is surrounded by an elaborate court and is assisted in the administration of the chiefdom by a council of elders.

Every Ashanti belongs to a matrilineage which is associated with a particular village, though many of its members may be living elsewhere. The adult members of the lineage, male and female, elect one man to be the lineage headman. He represents the lineage in its dealings with other groups and is responsible for maintaining amicable relations between lineage members. Also, he is the guardian of the Stool which represents the lineage ancestors, the sacred symbol of lineage unity.

All the lineage headmen of a village combine to form a council and elect one of their number as the village headman, or *odekuro*. He is their link with the chief either directly or through one of the elders on the chief's council, and it is through him that the orders of the central authority of the state are transmitted.

The elders, with a few exceptions, are the heads of important lineages in the capital. They are chosen by their fellow-kinsmen subject to the chief's approval, and each holds a title and an office which is connected with the lineage Stool. The offices fall into two groups, the first of which is concerned with the affairs of the court and royal household.

Ashanti Court Officials

Among its most important members are the *gyase*, who supervises household officials such as treasurers, cooks, and minstrels; the *okyeame*, who is the chief's spokesman on public occasions, announces his judicial verdicts, and represents him in diplomatic contacts with other chiefs; and the *abusuahene*, who looks after the affairs of the royal lineage and settles disputes involving its members, thus protecting the chief from charges of favouritism.

The second group of elders is concerned with the military organization, and it includes the leaders of the main army groups and the chief's bodyguard. The army itself used to be organized on a lineage basis, each lineage providing its own warriors with a leader responsible to one of the military elders.

Another important court official in Ashanti is the queen-mother, who is usually one of the chief's sisters. She is among his closest advisers, and it is her duty to reprimand him if he behaves in unkingly fashion. Apart from this, she concerns herself with the matrimonial affairs of the royal household, adjudicates in disputes between its members; and she was formerly a member of the chief's judicial court.

Powers of the Chief

The chief himself is elected from among the members of the royal lineage. He must be approved by the elders, and by the commoners who have their own organization, and if his conduct should fall below the required standard they may "de-stool" him. As the keeper of the royal Stool he is the focus of the unity of the chiefdom. As political head of state he must reconcile the conflicting interests of the lineages represented by the elders, and he is the custodian of the law and the military commander.

He has the right, subject to the approval of the elders and commoners, to use physical force to secure obedience to his commands. All offences, such as murder, witchcraft, and treason, which are regarded as being crimes against the whole community, come before the chief and his elders, who have the acknowledged right to apply physical sanctions.

The Ashanti chiefdoms, by a process of alliances and conquest, formed a federation under the *Asantehene*, the head of the Kumasi chiefdom. Each chiefdom retained a large measure of independence in internal affairs, but they were bound together in allegiance to the Asantehene and, in particular, to the Golden Stool, the " soul " of the Ashanti nation.

Regular rituals were held in Kumasi in connexion with the royal ancestors whom the Stool symbolised and these were regarded as necessary for the well-being of all Ashanti. The political system of Kumasi itself differed from that of the other chiefdoms in the stress that was laid on the military organization as opposed to the lineage system. Any attempt to secede from the federation was opposed by force.

Each chief has as his representative with the Asantehene one of the military officials of the latter's court. The Asantehene presides over a court of appeal for all Ashanti, which hears disputes between different chiefdoms and charges of treason against the federation.

It will be appreciated that although kinship plays a large part in its political organization Ashanti differs widely from the kinds of societies previously described in these Lessons. It has all the characteristics of the state—regular governmental machinery, a central authority legitimately exercising a monopoly of physical force, and well-defined legal and military institutions. Its wars, in contrast with those of other peoples, were wars of conquest which entailed the subjection of the defeated enemy.

LESSON 13

Age, Rank, and Conquest

In many societies, at very different stages of political development, kinship and lineage organization provide a framework within which authority is assigned to individuals as leaders or rulers. Among such peoples as the Tallensi the authority they wield may not be strictly political, for the sanctions for maintaining it are moral and religious rather than physical.

The chiefs and elders of the Ashanti, on the other hand, do wield definite political powers , yet they too owe their positions to the fact that they are the representatives of particular lineages. But authority may be assigned on other principles, such as age, membership of particular associations, rank, and caste.

As previously pointed out, among some Australian tribes where the local group coincides with a kin-group it is the older men that direct collective enterprises and express the moral disapproval of the community when an individual offends against the accepted code of behaviour. Age may be a governing factor, too, in communities made up of different kin-groups. An Ashanti village council is composed of the heads of the lineages associated with the village.

In Benin villages in Southern Nigeria the village council is simply the senior of the three age-grades, irrespective of the lineage affiliation of the individual members, and the village headman is the oldest man among them His authority, like that of the Tallensi lineage head, is mainly of the moral and religious variety.

Supernatural Punishment

As custodian of the shrine of the collective village ancestors he is believed to have the power of calling down supernatural punishment on the heads of offenders. His authority goes a little further, for he has the right to impose physical sanctions in the form of fines. If the convicted person refuses to pay up, the headman can enforce his judgement by directing the middle age-

TRIAL BY ORDEAL. Among some primitive peoples guilt or innocence is determined by ordeals when other evidence is lacking. Here a Zulu is plunging his hand into boiling water. If the hand is withdrawn unscalded (which is extremely improbable, of course) he is regarded as innocent. A ritual specialist is supervising the proceedings.

THE WITCH-DOCTOR DELIBERATES. The belief that the witch-doctor possesses the power of detecting criminals by means of dice or other objects is a powerful deterrent against possible breaches of the local laws.

grade to seize the offender's property. In the past, and with the consent of the elders, an incorrigible offender would have been sent to the king of Benin to become his slave.

Secret Fraternities

In some societies authority is assigned, for certain purposes, to particular associations within the community. An example of this has been given in the societies which police the bison hunts among the Plains Indians. Such associations do not confine their activities to the political sphere. They often perform ritual, educative, and other functions.

The Ogboni secret fraternity among the Yoruba of Nigeria, for example, was primarily a religious cult, but it had its own titled chiefs and it was able to exert considerable political pressure upon the king. It took upon itself legal functions, and could order a subsidiary association to remove dangerous criminals and others who offended against its members.

In some West African societies secret or other associations simply performed executive functions as directed by the chiefs or elders ; in others, they were the real source of political power.

In other primitive societies, especially in Polynesia, it is rank which confers the right to rule. In Hawaii the ruler claimed descent from the gods, and in order to preserve the purity of his line he married his sister. Among the Samoans titles and rank were not hereditary ; they were awarded by households, villages, or districts, to men who showed courage, integrity, ability to lead others, and similar admired qualities. Young men sought to outstrip each other in warfare and economic pursuits and studied to develop those qualities of bearing, eloquence, and ceremonial knowledge which would lead them to be honoured with titles.

A Council of Chiefs

There were two kinds of titles, those belonging to *sacred chiefs*, and those which were given to *talking chiefs*, each group having numerous sub-grades. Sacred chiefs were believed to possess great supernatural powers which increased with their rank. A high-ranking sacred chief could never be touched by a commoner, and the latter had to address the chief in a special ceremonial language.

Talking chiefs were the executive officers ; they spoke on behalf of the sacred chiefs on public occasions, hence their name. Very often the talking chiefs were more influential than the men they represented. Each village and district was ruled over by a council of the chiefs, headed by the highest-ranking sacred chief among them. They settled disputes between members of the community and, in the case of the district, sought to prevent wars between component villages.

BENIN BRONZE. In the kingdom of Benin in West Africa the king's mother is an important personage, with her own court and palace. When she dies bronze heads like this are placed on her altar.
British Museum

In some societies, usually at an advanced stage of political development, political authority is reserved to a particular caste. The Masai cattle-herders of East Africa have in their territory two other groups : the Wandorobo, who are hunters, and a blacksmith caste. Both are subject to the rule of the Masai and have no political rights of their own.

Moreover, the Masai keep themselves apart from these subordinate groups by refusing to intermarry with them. The Wandorobo act as their spies, and the black-

smiths provide them with their weapons. A Masai could kill a blacksmith without fear of punishment.

In Ruanda-Urundi there are three castes—the Tusi herders, the Hutu agriculturists, and the Twa hunters. The Hutu formerly lived in a number of independent tribes, each with a headman; the Tusi conquered the area and welded it into a kingdom, subjecting the other groups and making them pay taxes and tribute.

The Hutu headmen were retained as petty officials and tax-gatherers, and the Twa were pressed into service as the king's carriers and bodyguard and were given minor executive posts at his court. But all the real power was reserved for the herders themselves.

Some of the more elaborate political systems among primitive societies have resulted from the conquest of certain groups by others. This is true in Ruanda-Urundi, and to some extent among the Ashanti. Conquests of this kind presuppose a completely different kind of warfare from that of the Australian aboriginals, for example· with the aboriginals, to dispossess a neighbouring community of its rights over its territory is unthinkable.

LESSON 14

The Aztecs and the Incas

Two examples of rather complicated conquest states among peoples still living at a relatively low technological level are provided by the Aztecs and the Incas. The Aztecs of Mexico, though they had neither metal tools, nor ploughs, nor beasts of burden, were able in a favourable environment to produce a large surplus of food which allowed for much occupational and commercial specialisation. They developed a complex political organization, and an empire which when Cortes conquered it in 1521 included much of what is now central and southern Mexico.

The Aztec empire seems to have grown up when three tribal groups in the valley of Mexico, having built up wide trading contacts, formed an alliance and began to conquer surrounding peoples. The dominant unit was the city of Tenochtitlan, which was built on an island, on the site of what is now Mexico City. The conquered peoples were allowed a great deal of internal autonomy, but they owed allegiance and tribute in goods and services to the emperor at Tenochtitlan.

THROUGH SACRIFICE TO THE AZTEC PARADISE. The Aztecs had an elaborate religion. Human hearts were a necessary food for the gods. Here a priest armed with an obsidian knife is tearing out the heart of a living sacrificial victim. Those who were killed in this way were believed to go straight to the paradise of the Sun, which was said to be located in the East.

British Museum, Zouche Codex

Tenochtitlan itself was divided into 20 *calpulli* or clans, each of which owned a dwelling area, farming land, a council house, and a temple. Each had a civil head, a military leader, and a speaker who represented it in the state council. The warriors of the state were organized into four regiments each containing those from five calpulli and each under a captain. The four captains formed a military council to advise the emperor.

The state council consisted of the speakers of the calpulli, who met periodically to conduct affairs of state, to decide questions of peace and war, and to hear disputes between members of different calpulli. There was a more inclusive state council which included the speakers, the calpulli headmen, military leaders, priests, and other officials.

This council judged cases at the highest level, and selected a new emperor when the old one died. The emperor himself had to be a member of the royal lineage. He was the supreme military commander. All taxes and tribute were collected and distributed by him, but he was subject to the supervision of the councils.

So far the government of Tenochtitlan seems not unlike that of an Ashanti chiefdom. Kinship groups are given a say in political affairs, and there is scope for the expression of democratic opinion. There grew up, however, a three-fold class structure which at the time of the Spanish conquest in the early 16th century seems to have overshadowed the calpulli principle to a large extent.

The upper class consisted of *tecutin*, or lords, who were given titles by the emperor for their services as warriors, merchants, and in other capacities. They gained special privileges such as exemption from taxation, and they often

received personal estates from the emperor. They thus became independent of the calpulli and more personally attached to the emperor.

The middle class were the ordinary members of the calpulli who were represented in the councils. At the bottom of the scale were slaves and dispossessed freemen who had committed some crime and who were allowed no voice in the government. So political power seems to have been largely concentrated in the hands of the Aztec emperor and his lords.

Empire of the Incas

Inca political organization was astonishingly authoritarian. Like the Aztecs, the Incas had a well-developed economic system based on intensive farming involving the use of large-scale drainage and irrigation systems. Their empire grew as the result of a long series of conquests into a vast domain stretching from southern Colombia to central Chile.

The Inca population was divided into four main classes. At the top of the scale came the Inca *nobility*, the emperor and his relatives who claimed descent from the sun-god. They were followed by the *curacas*, the nobility of the conquered peoples. Thirdly, there was the *puric* class of commoners; fourthly, a hereditary class of craftsmen and servants to the Incas.

All political and economic power was in the hands of the first two classes and ultimately belonged to the emperor himself, who owned all property, had the power of life and death over all his people, and was the supreme religious, military, and judicial head of the state. The Inca empire was divided into four districts, which were divided into four provinces of approximately 40,000 households each, which contained four tribes of 10,000 households each, which were made up of ten units of 1,000 households, and so on right down to the level of ten households. The largest scale units were administered by Incas, those of middle range by curacas, the smallest by purics.

The last had little power, and the authority of the Inca and curaca governors was subject to the wish of the emperor, who kept watch over them by a system of police and spies, and by personally visiting different parts of his empire at regular intervals.

All the actions of the purics were controlled by law. A puric had to marry at a certain age, and he was given enough land for his needs, the amount increasing as his family increased, decreasing as his children grew up, married, and founded their own families.

Part of his time was spent in working for the state as a soldier, craftsman, or labourer in the production of a surplus for the support of the nobility, the old, the sick, and the disabled. The Incas took a census of population and property each year and labourers were re-allotted according to the needs of the moment. No puric could leave his own community without permission.

Like some totalitarian states of modern times the Inca empire seems to have been at its most efficient in time of war, when the whole population was devoting itself to a common purpose. When it had conquered all its opponents it began to fall apart, and by the time of the Spanish conquest it was on the decline.

LESSON 15

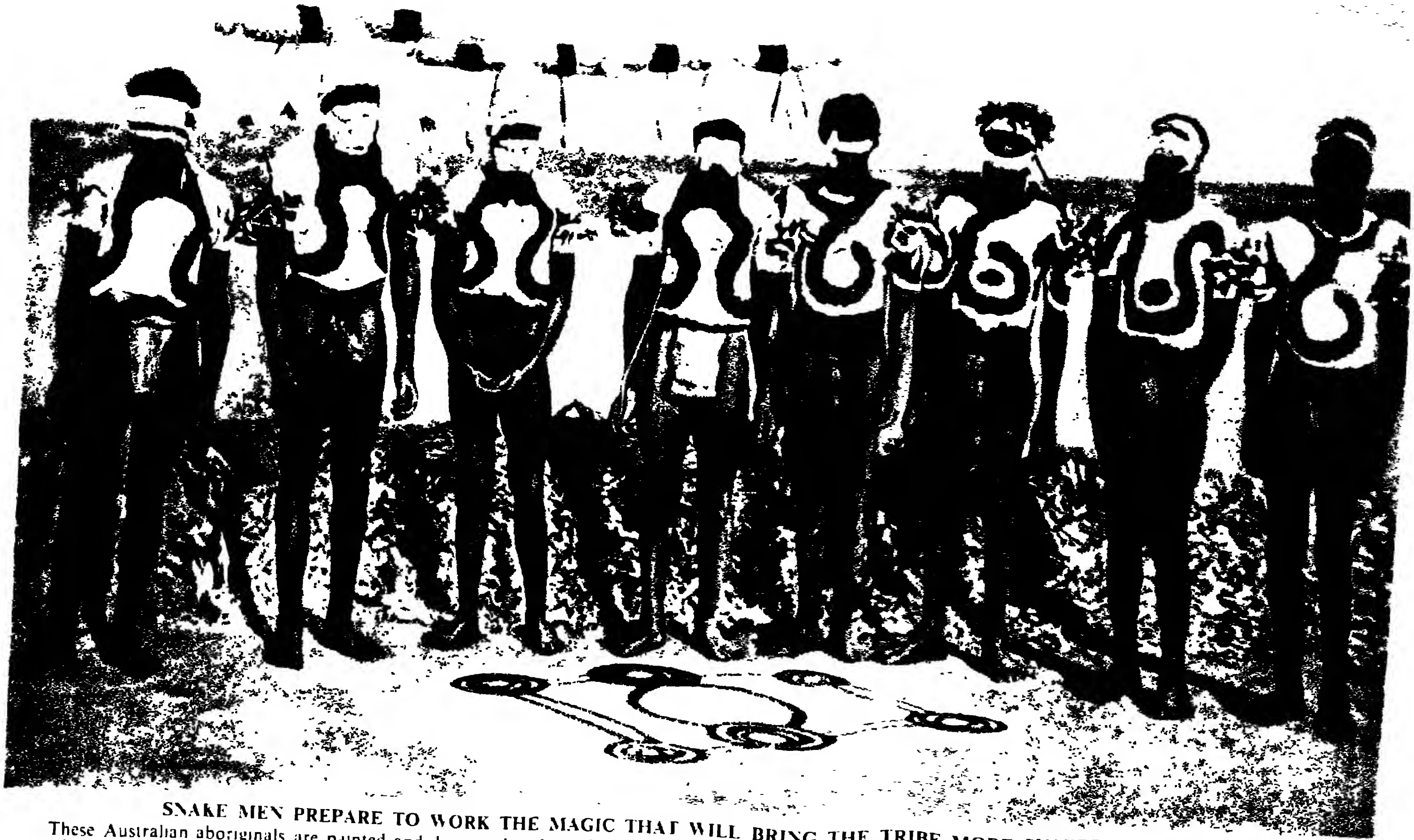
Religion and Society

As these Lessons have revealed, every society, however simple, has developed techniques for dealing with its environment and supplying its needs and has solved some of the problems of living together in a more or less orderly fashion. But when man has done all he can by practical measures his crops still fail, his canoe capsizes, his children die, and he finds himself in conflict with his neighbour.

Such contingencies he attributes to forces, spirits and deities, which he cannot see. He feels dependent upon them and he seeks to propitiate and control them for his own well-being. Many religious activities are associated with the crises of life: birth, adolescence, marriage, illness, and death. The agricultural seasons stimulate their own rituals. Where there is a division of labour specialised groups may have their own spirits and gods.

MAYA RAIN GOD. Owing to the importance of rain for the maize crops, the rain god, portrayed with the snout of a tapir, the "lightning animal," was one of the chief Maya divinities.

The blacksmiths of the Yoruba and Benin kingdoms of West Africa worship *ogun*, the god of metals. So do the hunters who use metal weapons. Thus man's sacred activities complement his practical measures at every turn.



SNAKE MEN PREPARE TO WORK THE MAGIC THAT WILL BRING THE TRIBE MORE SNAKES FOR FOOD

These Australian aboriginals are painted and decorated with symbols intended to give them something of the appearance of snakes. When each is thus adorned and engaged in magical practices, he himself and his tribe imagine that he has become a kind of divine snake having power over ordinary snakes. Similar twisting designs are painted on the bodies of the men who take an active part in the burial services of certain of the tribes

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SERPENT TOTEM OF AN AUSTRALIAN NATIVE TRIBE

Macmillan

These aboriginals are building a mound to represent the mythical serpent Wollunqua. Believed to be 150 miles long and an ancestor of the tribe Wollunqua is said to live with part of his body fixed in the waterhole of the Murchison Range, the only one in the country that never dries up. It is Wollunqua's duty, from which he is always trying to escape, to keep a supply of water for those who reverence him. Wollunqua is to be persuaded by means of this mound to do his duty faithfully.

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Another function of religion has been emphasised by the French sociologist Durkheim and his followers—its social nature, what it does for the society. Common participation in religious rites for the common good, they point out, helps to unify the cult group, giving a sense of solidarity which otherwise would be lacking. For example, the funeral ceremonies and elaborate mourning ritual of the Trobriand Islanders help the bereaved group to readjust themselves to the loss of one of their members and draw them closer together in their common fears and sorrow.

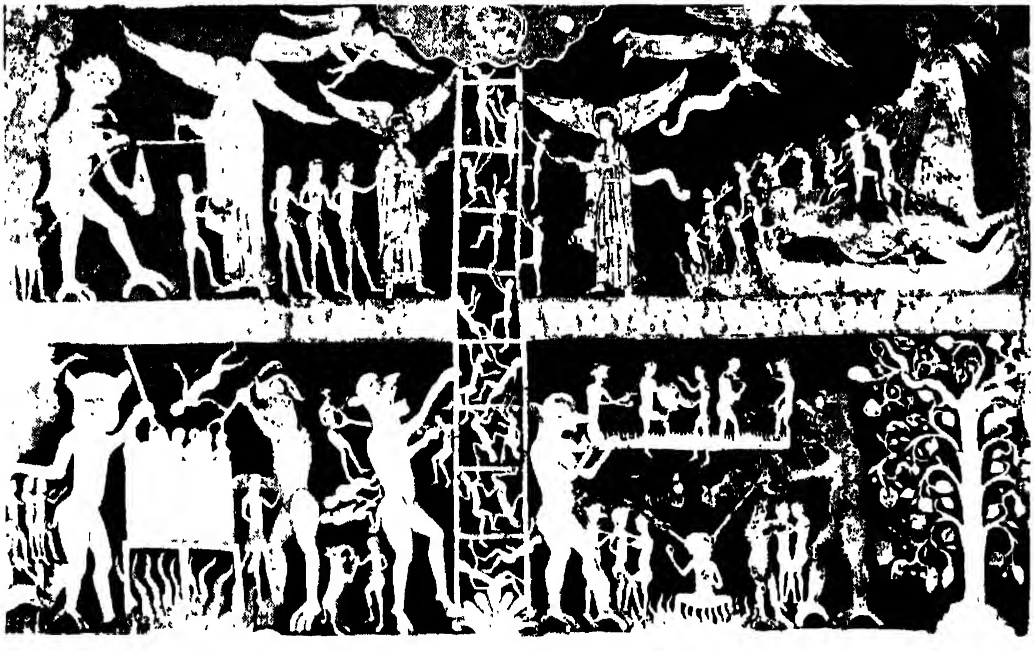
Totem and Clan

One of the numerous forms of religion is totemism. Perhaps the most satisfactory definition of totemism is that given by Professor Radcliffe Brown, who uses the word to apply " whenever a society is divided into groups and there is a special relation between each group and one or more classes of objects that are usually natural species of animals or plants but may be artificial objects or parts of an animal." The totemic group may be of various kinds.

In New South Wales sex totemism occurs, the bat being the men's totem, a bird called the tree-creeper the women's. Moiety totemism and even individual totemism are among other varieties occurring in Australia; but the most common relationship is that between a totem and a clan, though by no means all clans are totemic.

The first point to remember about totemism is that it is not so much animal worship or plant worship as the affiliation of a group with an animal or plant species. Usually the totemic clan is named after its totem, and often the people and the animals or plants are said to be descended from the same ancestors. Often the group is not allowed to kill or eat its totem animal, and some tribes will not even look upon their totems or mention the names of these.

Clans of the Iroquois of North America are named after animals, such as the bear, turtle,



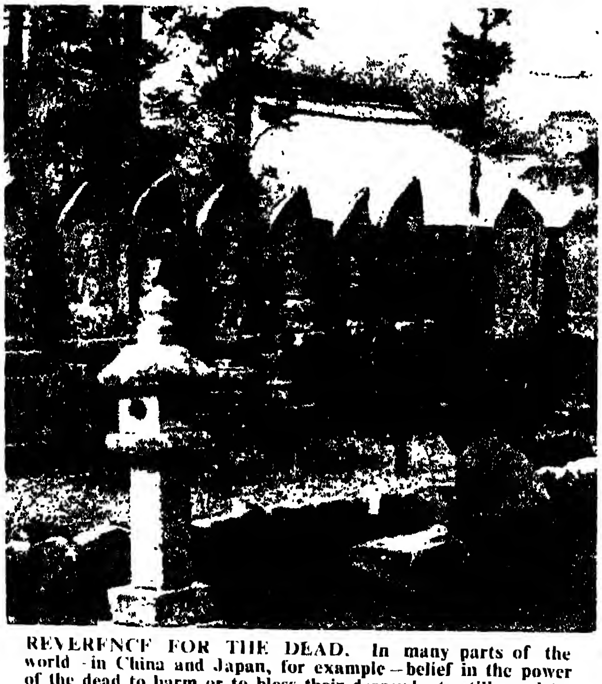
MEDIEVAL CONCEPTION OF HELL. Religious beliefs are always a powerful deterrent to anti-social behaviour, and not only in primitive religions. This 12th-century wall painting in Chaldon Church, Surrey, represents " The Ladder of the Soul's Salvation." In the centre a ladder leads from hell to heaven—marked by a vision of God set in a circle at the top. In the upper left-hand portion St. Michael is weighing souls, while Satan endeavours to depress the scale. In the lower left-hand portion two demons are stirring souls in a cauldron ; another demon with a pitchfork picks off souls from the ladder as they try to escape ; a third demon, lying on his back, is biting the feet of three small figures supposed to be girls who were too fond of dancing ; and a dog is biting the hand of a woman who gave to dogs what she should have given to the poor. In the lower right-hand portion two demons are compelling souls to cross a bridge of spikes ; beneath, surrounded by flames and money-bags, sits a usurer, gold coins pouring from his mouth. In the top right-hand portion is shown the " harrowing of hell " by Christ, assisted by two angels. " Doom pictures " such as this were popular in the Middle Ages, when extremely few people could read.

and eel, but no other relationship is claimed. The clans of the potlatching Haida have been described as totemic, but their totemism turns out to be nothing more than a series of totemic crests representations of animals tattooed on the bodies of clan members and carved and painted on their houses and other belongings just to indicate to which clan they belong.

ESKIMO DUCK DANCE. Ritual commonly bears a close relation to the chief activities of the tribe. Here, with all due ceremony, an Eskimo archer is celebrating a successful day's shooting.

Classic examples of totemism come from the Australian aboriginals. The Arunta, like some other Australian tribes, live in hordes made up of patrilineally related relatives and their wives, each horde being attached to a particular hunting territory. In each territory there are a number of totem centres, sacred spots marked by special trees or rocks where the mythical ancestors of the totemic groups are believed to have died and disappeared into the ground. At each centre is a *churinga*, a sacred object which the ancestors are believed to have left behind.

Around these centres lurk the souls of ancestors waiting to enter the womb of a passing woman and impregnate her. As noted in a previous Lesson, these people are not aware of physical paternity. Each individual belongs to the totemic group at whose centre he was conceived, and since the totem need not be the same as his father's or mother's the totemic cult groups are not necessarily clans. But clan totemism traced through the mother is also found in the same area of Australia.



REVERENCE FOR THE DEAD. In many parts of the world—in China and Japan, for example—belief in the power of the dead to harm or to bless their descendants still persists. Here a Japanese peasant is in an attitude of devotion before the graves of his ancestors.

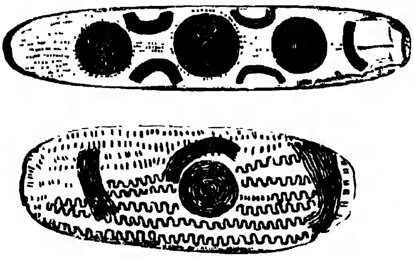
The ancestors of each totemic group are believed to have been connected with a particular animal or plant species. Members of the group must not kill or eat their totem (or eat only sparingly). In some parts of Australia they may do so only on ritual occasions, the rituals being directed towards the increase of the totemic species.

Ritual Food

The Witchetty Grub men, for example, paint themselves with their totemic crest and act out the hatching of the witchetty grubs from a "chrysalis" made of boughs. When the season for collecting the grubs comes round, the men exercise certain controls over the killing and eating of the species. Thus the totemic group is responsible for maintaining and, by ritual, increasing part of the food supply.

Many explanations of this kind of totemism have been given. Perhaps

the most satisfactory is that suggested by the French sociologist Emile Durkheim (1858-1917), and later developed by Professor Radcliffe Brown, who says "the wider unity and solidarity of *the whole totemic society* is expressed by the fact that society as a whole, through its segments, stands in a ritual relation to nature as a whole."



CHURINGA. **Among the aborigines of Central Australia, the Arunta in particular, the spirit of each individual is believed to be intimately associated with a churinga a flattened slab of wood or stone, usually adorned with totemic carvings. When a child is born the kuruna or spirit is supposed to leave the churinga and enter the child, ultimately returning to the churinga when death takes place.**

The Australian aboriginal lives very close to nature and he is highly dependent for his existence on the species with which he allies himself. So nature, or the important parts of it, are brought within the framework of human society. Since the society is divided into groups of various kinds the tendency is to associate one or more species with each group and to make that group ritually responsible for its abundance.

A common religion in primitive societies is the worship of the past members of the society. This ancestor worship may take different forms. The ancestors of the Australian aboriginals are mythical heroes who are associated in their beliefs with the totemic species.

The Edo people of Nigeria have special cults addressed to former heroes in the history of the Benin kingdom, who never died but turned themselves into the rivers and ponds that one can see today. But when one speaks of an ancestor cult one thinks rather of a society organized on lineage principles with each lineage serving its own immediate ancestors and expecting protection and aid from them.

Among peoples already discussed, the Tallensi have a strong ancestor cult; the head of each lineage segment derives much of his authority from the fact that he is the intermediary between the living and dead members of the lineage. The Ashanti matrilineages each have their ancestor cult, the ancestors being represented by carved stools; the ancestors of the royal lineage, represented by the Golden Stool, are of significance not only for the royal family but for the people as a whole and great state rituals are addressed to them.

Ancestor worship is, in effect, an extension of the family or lineage into the supernatural. The relations between the ancestors and the living are similar to those between parents and children, with the exception that the ancestors being supernatural have more far-reaching and more wonderful powers to help and punish

In Benin, when a man dies an elaborate series of funeral rites is carried out. On the final evening of these rites someone is chosen to dress up as the dead man. He sits watching the proceedings, while his descendants sing and dance for him, and each of them in turn comes and kneels before him, salutes him, and presents him with a few coins. The "father," as the dead man is called, breaks kola nuts and eats with his descendants, then gives them advice, telling them their faults, praising them for their virtues, and assuring

EXORCISING THE DEVILS OF DISEASE. **In the belief that disease is caused by evil spirits, or devils, who have taken possession, some peoples in the East endeavour to cast them out by means of so-called devil dances, as in this example from Ceylon. In fantastic masks and costume they perform ritual dances to the accompaniment of music.**

them that though he is now going to take his place in the spirit world he will still look after them as he has done in this world

The following morning a shrine is erected to him and a goat sacrificed and he is told that it is here that he should come in future, in the spirit, to meet his children when they require his help. It is here they will feed him and worship him, especially during the annual festival of ancestor worship when all his descendants will gather together to remember him.

The ancestors in Benin watch over the affairs of their descendants, punishing them and their wives for misdeeds which bring shame upon the family. To anger the ancestors is to court sickness, and even death ; to please them is to gain favours of all kinds. Such a cult has a great unifying influence on a lineage It gives the headman who is the priest of the ancestors supernatural sanctions with which to rule his people. It reduces conflict in the family, because the ancestors forbid it and their anger may fall on the guilty and innocent alike. It is thus closely adapted to the needs of societies in which kinship relations play a large part.

Divine Kingship

Ancestor worship is a projection of human society into the supernatural world The supernatural world may be brought into this world as in the institution of divine kingship. In Benin, Nigeria, the king's ancestors are among the most important state gods and the subject of prolonged annual rituals. But the Benin king, as the descendant of these gods and a reincarnation of one of them, has his own divinity.

The ancestors' priests are his priests too, and in one of the most important annual rites they make sacrifices to his head. At the same time he is strengthened by the application of special medicines. For on his health and well-being depend the prosperity and well-being of the whole Benin people.

Divinity and Health

This idea is taken a step further in some parts of the world where the divinity of kings or chiefs lasts only so long as they are physically fit. Sir James Frazer studied this notion at great length, in an attempt to explain the custom whereby the priest of the sacred grove of Aricia in early Roman times gained his position only by killing the previous priest.

The divine Shilluk kings of the Upper Nile always remained unguarded at night and open to attack from any pretender of the royal lineage. Among the Aztecs of Mexico a young man of perfect physique was chosen to represent the god Tezcatlipoca, and after being treated to every luxury for two years he was sacrificed. The soul of the god then passed into another youth chosen to replace him.

The idea behind such practices is that the presence of the divine soul in the tribe ensures its prosperity ; if the vehicle that it occupies deteriorates in physical strength the luck of the tribe wanes too. Crops fail, herds are depleted, women lose their fertility, sickness and death come to the people. The divine king or priest in perfect health is the symbol of the tribe's strength and prosperity. Everyone has an interest, for his own sake, in the well-being of the king or priest.

The supernatural beings that men worship vary from simple spirits and ghosts that inhabit the woods and streams to elaborately conceived pantheons of deities.

LESSON 16

Mana and Taboo

In parts of the world there is a belief in an impersonal supernatural force which permeates the universe. *Mana*, as it is called in numerous Polynesian and Melanesian languages, is invisible and it is never embodied in any one spirit or deity. It is a force which any being or object may possess in large or small amounts.

Gods and spirits must have mana, for they are possessed of supernatural powers. Human beings and animals, phenomena such as the sun and moon, rain and thunder, and natural objects like stones and bones, ponds and streams—all these may have mana.

In Melanesian belief mana, according to Codrington, is a potency " which acts in all ways for good and evil ; and which it is of the greatest importance to possess or control." Ghosts of various kinds play a large part in Melanesian ideas about the supernatural Ghosts are full of mana and act through it, and much of the religious life of the Melanesians is devoted to the propitiation of them so that control may be obtained over their mana.

For without mana yams will not grow, canoes will not be swift, and weapons will have no effect. When an object is known to have mana it may be buried in the yam plot or laid on the canoe—for " luck."

A similar belief occurs among some North American Indian tribes. The Iroquois call it *orenda*, the Algonquins *manitou*, the Sioux *wakan*. A Sioux informant tried to explain wakan in this way : " When a priest uses any

object in performing a ceremony, that object becomes endowed with a spirit, not exactly a spirit but something like one ; the priests call it *tonwan* or *ton*. Everything that thus acquires ton is wakan, because it is the power of the spirit or quality that has been put into it.

The Force Wakan

"The roots of certain plants are wakan because they are poisonous. Some birds are wakan because they do very strange things. Anything may be wakan if a wakan spirit goes into it. If a person does something that cannot be understood that is also wakan. Drinks that make one drunk are wakan because they make one crazy." The difficulty which the informant experienced in explaining the belief illustrates the impersonal nature of the force called wakan. An Oceanian might explain *mana* in much the same way.

UNDER TABOO. Rendered taboo by having touched a dead body, this elderly Maori was cut off from all contact with his fellows. He might not even touch food with his hands, lest he should spread contamination, and was fed by another person with a forked stick.

Supernatural beliefs are adjusted to the societies in which they are held. The Polynesians pay great attention to rank, their whole society being divided into a number of social classes within which persons are ranked individually. It is not surprising that they use mana to explain their complicated system of ranking by birth and achievement.

The persons of highest rank are those with most mana, and vice versa. In some areas mana is believed to be inherited from both parents ; elsewhere, it can be achieved only by circumspect behaviour and proved skill in warfare, ritual, and craftsmanship

Even if mana is inherited its possession must be proved by success. If a great warrior is killed it is because he has lost his mana If a village is defeated in warfare the chief's mana which formerly protected it must have declined, and in the face of this or any other catastrophe the chief will probably be replaced.

The Chief's Shadow

Because mana can flow from one object to another, and from one person to another, the most important chiefs are cut off from commoners by an elaborate system of taboo so that their stores of mana may be preserved for the common good. The highest ranking sacred chief lives alone and his shadow may not fall upon anyone, for he might thereby pass his mana on to someone who is not strong enough or of high enough rank to support it.

Ceremonies are performed for increasing the mana of a chief, a canoe, or some other object. Mana is not the only supernatural interest of the Polynesians. They have a most elaborate pantheon of gods and goddesses, comparable to those of ancient Greece and Rome—and the gods possess mana in proportion to their rank. Some authorities have suggested that the main religious ceremonies are directed towards maintenance and increase of the mana of the gods so that the latter may use this mysterious force for the benefit of human beings.

Mana and kindred concepts are efficient ways of explaining the vagaries and uncertainties of life. Since the power is impersonal it can be possessed by anything, and since it is amoral it can be used for good or evil It can explain not only all that is wonderful and supernatural in the universe, but qualities which men have in varying amounts, such as success, skill, and leadership.

Balance of Mana

For the Polynesians it explains some of the most important features of their social system. For the individual it is a foolproof explanatory principle for success and failure, because it can be gained and lost, and because others may have more or less of it than oneself.

Taboo, which has come to mean anything that is forbidden by convention rather than law, is a word which has been given to us by the Polynesians. For them taboo is anything that disturbs a person's proper balance of mana A chief is taboo to a commoner because transmission of the chief's mana to the commoner would be disastrous to both.

The chief would not have enough for his status, and the commoner would be overloaded. So the chief is hedged about with taboos. When a barber cuts his hair the barber's hands become taboo and he may not

touch his own head with them, not even feed himself, until he has been purified by the appropriate rites.

Functions of Taboo

Chiefs are taboo because they are, in a sense, holy or sacred. At the other extreme, things which are regarded as unclean are taboo. Among some primitive societies, indeed, the notions of uncleanness and sanctity are closely identified. The Jews and Muslims taboo the pig, which they regard as unclean ; the Hindus will not eat their sacred cows. In most primitive societies there are taboos clustered around death and sex and its manifestations.

In Polynesia a man who touches a corpse and does not observe the proper taboos is as likely to fall sick and die as if he had touched a chief Menstruating women, and women who have just borne children, are other powerful sources of taboo in some societies

In Benin villages in West Africa a separate room is set aside in each house for menstruating women, and if one of them should stray into the rest of the house it becomes taboo and it and the shrines in it must be purified - or sickness and misfortune will befall the people who live there. In some African societies sexual relations of any kind are forbidden to the warriors while they are preparing for war.

Like mana, taboo provides explanations for the uncertainties of life. Whatever taboos a group or an individual takes upon itself, they provide the comforting notion that danger and evil can be avoided by being circumspect in behaviour.

When things go wrong it may be because a taboo has been broken, and there is always some rite which may remedy the breach. Though the physical effects of such a remedy may be nil they may be of great psychological value in a society which lacks scientific knowledge of medicine and disease.

Again like mana, taboo is used in Polynesia to bolster up the social system. A chief can exert his authority by putting taboo on both men and things. Taboo can be used to protect farms and other property from trespassers and thieves. It also has a more general social value, for it prescribes a common code of behaviour which gives the members of the society a feeling of unity and solidarity. To break a taboo may be dangerous not only to oneself but to relatives and friends.

LESSON 17

Rites of Passage

An important part of the religious system of any people are the rites in which they engage. Religious rites may be seasonal or take place at fixed intervals. They may be performed to meet particular crises and contingencies. They may be associated with events in the life-cycle of the individual. It will be of interest to take some of this last category and consider in what light the anthropologist views them

The greatest events in all human societies are birth, marriage, and death. In many groups people enter institutions such as clubs, secret societies, age-grades, etc All these events involve changes in the relations which the persons concerned have with their fellow-men, and very frequently these changes are marked by some kind of ceremonial which dramatises them and helps the people involved to adjust themselves to the new situation that has arisen in their lives.

WEDDING RICE-THROWING. The widespread practice of scattering rice over bride and bridegroom was originally intended to symbolise wished-for fertility and to propitiate evil spirits. The substitution of paper confetti for rice robs the custom of its meaning.

Such rites make it clear that someone has taken on a new social role which will bring about new rights and obligations. Since the main purpose of rituals of this kind is to signify the passage of individuals from one social state to another they have been called *rites of passage*. Not all the occasions mentioned are marked by rites of passage in all societies-- but all of them, and others besides, such as illness and injury, evoke rites among some people or other.

Although rites of passage vary a great deal in content, complexity, and emphasis, Van Gennep showed that they commonly have three stages, which he called *separation*, *marge* (transition), and *aggregation* (incorporation). A rite of separation cuts off the individual concerned in it

from his past social relations.

The second stage is a transition period in which he interacts in his new relationship but has not returned to full membership of the community at large—the honeymoon is a good example. The third stage reincorporates the individual, allowing him to take up his new role in full.

Often the person undergoing a rite of passage is thought of as becoming, in some degree, a "new" man or woman and the ritual symbolises death and rebirth. The marriage ceremonies of the Benin people provide an example. Sometimes suitors may apply for the hand of a baby girl as soon as she is born. Her father or guardian will eventually accept one of them, who will begin to work for him at intervals on his farm and send presents to both parents.

MARRIAGE BY CAPTURE. Among the various ceremonies that are performed on the occasion of a Zulu wedding one of the most striking is the enacting of the attempted rescue of the bride, who, according to tradition, is supposed to have been stolen from her people by the bridegroom. The bridesmaids, acting together in accordance with a preconcerted plan, make a determined rush as if to free the bride from her captor. In this united effort the bride, too, takes part, in order to make it clear that she herself has joined in this dash for freedom.

The girl meanwhile grows up as a member of her father's household and lineage, subject to his authority and care. After she reaches puberty her husband begins to think of completing the marriage. He visits the father of his bride and makes the marriage payment and a day is fixed for the wedding.

Informing the Ancestors

Before this takes place, offerings are made at the family altars of the groom and the bride's father informing the ancestors that a woman is being transferred from one family to the other. The aid of the ancestors is sought to ensure that the marriage will be happy, fruitful and prosperous.

On the appointed day, after dark, the bride, with her brothers and sisters and other companions, sets off for her husband's house, taking with her personal property and gifts from her parents. The latter do not accompany her, for, as they say, this should be a joyous occasion, but they are sorrowful at losing their daughter.

Often the bride's party will stop on the way and send a message to the husband that there is a tree across the road which prevents further progress. This signifies their reluctance to lose their sister, and they will not go on until the husband "cuts away the tree" by making a compensatory present to them.

When she reaches her husband's house her brother sets her down on her husband's lap: this, in a sense, is rebirth. The loyalty and obedience which the girl formerly owed to her father and mother and their duty of caring for her now passes to the husband.

Immediately afterwards she is bathed by the women of the household, in the same way that a new-born child is bathed. But before this the husband's other wives, if he is married, or some other women of the household, bring a bowl containing water and money and wash the bride's hands. They thus signify their acceptance of her as one of them, the money expressing the hope that the marriage will be a prosperous one.

Transition Period

By this rite of separation the girl is cut off from her own family and introduced into another in a manner which will make the transfer clear to the whole community. There follows a transition period of three months, during which she is not allowed to visit her old home. This gives the young bride time to become accustomed to her new status and surroundings.

Her mother comes to visit her, however, and the husband strengthens his ties with his

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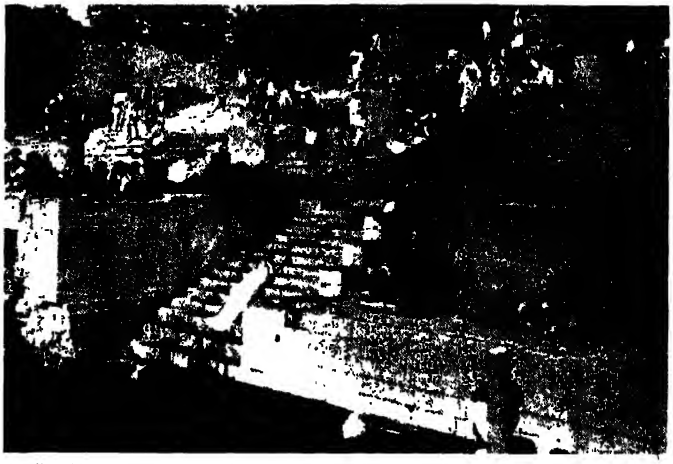
Her mother comes to visit her, however, and the husband strengthens his ties with his

in-laws by visiting them. In the meantime the bride is attached to one of the older women of the household, with whom she remains while she is taught her new duties.

But she is not wholly cut off from her own people. They still have rights over her and the stage of re-incorporation, in a new role, into her own family is marked by a prolonged visit at the end of three months. She may go back later to bear her first child, and each year her husband will send her to the annual sacrifices to her own ancestors to seek anew their blessing on the marriage and its offspring.



THE BURNING GHATS OF BENARES. A common feature on the Ganges, India's holiest river, is the ghat or flight of steps designed to facilitate ritual bathings. There are also special ghats on which the Hindu dead are cremated. The burning ghats of the sacred city of Benares are in most request. The body to be burned is anointed with ghee and, after prayers have been said, the next of kin sets fire to the pyre.

Initiation Rites

Dr Peristiany, who lived with the Kipsigis of East Africa, has described a series of rites which all youths of that tribe undergo as an initiation into manhood. The rites begin when five to ten youths of from 14 to 18 years of age are cut off from their people and taken by an older man to live in seclusion in the bush. There they build a hut, in which they will sleep for a prolonged period.

At daybreak the following morning they are led to another hut where they are made to pass four times through a passage of stinging nettles, then made to sit down four times on a stool of nettles. When this is over they are circumcised. During all these painful experiences, which are meant to teach them stamina and fortitude, they should be very brave. If they utter a single cry they will be disgraced.

Mock Fight

The boys are now regarded as being ritually unclean. They must not touch with their hands either food or any object which the Kipsigis hold sacred, nor may they mix with other members of the community.

A month later they go through another rite, which marks the beginning of their gradual reincorporation into the tribe as adult men. They must "fight" a warrior, with mock shields and swords, and submit to being beaten and stung with nettles.

Then each dips his hands into a bowl containing a knife, an arrow, an axe, salt, and other sacred objects which up to now they have been forbidden to touch. From this time on they are allowed to move about freely, but only in disguise, and they must still take care to avoid women.

ARTIFICIAL KINSHIP. Youths who undergo together rites of initiation into the state of manhood are henceforth bound together by common ties of suffering and exaltation. The initiation procdss sometimes constitutes a very severe test of endurance, as in this picture of young aborigines of Arnhem Land, North Australia, who are lying flat on their backs in the blazing sun while ants, and various biting insects, are strewn over them. Their faces are covered with bark to protect the eyes.

Every night they return to their hut to sleep. A month or two later, elders and warriors visit the boys and teach them the customs and morals of the tribe. An elder blesses them by spraying beer over them from his mouth, and they sing songs which embody some of the teaching they have received.

A month later, they bathe in the river, and then rush to seize objects which represent cattle—a rite which symbolises their future success as cattle-raiders. On the same day they are allowed to chase women and beat them with sticks, an action which is thought to rid them (the chasers) of uncleanness. Now they have more liberty. They can move about freely and sleep at home, but they must wear a ceremonial headdress.

Other rites follow, in one of which each youth is presented by his paternal uncle with a new skin or cloth to wear when the initiation is over. Then, for the first time since seclusion, their heads are shaved, they take off the special clothes and ornaments they have worn, and return to the tribe as fully-fledged adults.

Rights and Obligations

All these ceremonies are full of symbolism referring to the Kipsigi's life as cattle-owner and warrior, to fertility, and to the casting-off of the uncleanness which is associated with uncircumcised men. No woman will have relations with an uncircumcised man, and only after initiation can a youth take a sweetheart.

The main significance of the rites is to mark the passage of the youths into full adult membership of the tribe. Whereas they were of little account, they now know the secret rituals and have been taught their rights and obligations as members of a family clan, village, and age-set. They have gone through painful experiences to prepare them for manhood and now, for the first time, they will be allowed to bear arms.

LESSON 18

Magic and Witchcraft

While it is often easy to characterise a particular activity as magical rather than religious, and vice versa, it is more difficult to separate magic as a whole from religion as a whole. It has been suggested that the fundamental distinction is that while magic is the assertion of man's control over impersonal supernatural power by the means of a *spell*, religion involves a reliance upon the goodwill of supernatural beings approached by *prayer* and propitiation.

Another distinguishing feature of magic which has often been asserted is that it is generally a personal affair directed towards particular ends. Religion, on the other hand, tends to be the concern of a group organized into a "church" and seeking more general benefits.

Magic may be used for good or evil; religion has the general good of the believers as its purpose, one speaks of black magic but never of black religion.

Magico-Religious

While these two criteria serve to distinguish two main aspects of man's relations with the supernatural, they cannot be applied with complete satisfaction to the magico-religious practices of any particular society. The Winnebago of North America believe in spirits also in their own power to compel the spirits to work for them by making offerings of tobacco which the spirits cannot refuse.

People sometimes pray to their gods for assistance in particular and personal enterprises which may be to the detriment of fellow-believers. In a Benin village all the elders, acting together, will marshal their magical apparatus and use it to curse a member of the community not fulfilling his social obligations.

PROTECTIVE AMULETS. **Now regarded as simply decorative, horse brasses originated as talismans to avert evil or bring good luck. A full set numbered nineteen, of which the two horses above are wearing four each.**

What on the surface appear to be religious acts may involve magical procedures and vice versa. Man's relations with the supernatural are arranged along a continuum extending from the purely magical to the purely religious, and no dividing line can be drawn.

Long ago Frazer pointed out that many magical activities involve two basic assumptions: first, "that like produces like; and second, that

things which have once been in contact with each other continue to act on each other at a distance even after the physical contact has been severed."

These two principles he calls the *Law of Similarity* and the *Law of Contagion*

Pins in an Image

The law of similarity results in *homeopathic magic*, the commonest example of which is the making of an image to represent the whole or a part of an enemy's body, then damaging or destroying it by sticking pins in it, burning it, or by some other means. The treatment of the image is believed to affect the enemy in a precisely similar way.

Such practices are not unknown in Britain to-day. In Pennsylvania the technique has been improved by pasting a photograph of the victim over the image's face.

Contagious Magic

Homeopathic magic is sometimes directed to other ends. A Bushman on the hunt eats only the flesh of a slow-moving animal—so that his quarry may be slow-moving too Women who have had children may be preferred to barren women for the task of sowing crops. Rites which simulate human procreation may be directed towards increasing the fertility of the earth.

Rain may be "produced" by sprinkling water from a vessel, as do the Southern Bantu. The Navaho of North America make sand paintings of their gods and stand on them to absorb the god's powers and so be cured of illness.

The law of contagion comes into play in such practices as obtaining hair, finger parings, excreta, or some other part of the victim's body, and reciting a spell over that. Sometimes the two principles are combined, as when objects of this kind are used in making an image of the enemy. Contagious magic can also be used for good.

When Magic Fails

In "working" all forms of magic there are always good excuses—or explanations—for failure : the rite was not properly enacted, or the spell was imperfectly spoken ; other and more powerful magicians were working towards the opposite effect ; or unknown supernatural forces were interfering. Successes are remembered long after failures are forgotten.

Like religion, magic offers man comfort in the face of the unpredictable elements in the universe. Primitive man does not try to substitute magic for practical techniques, but rather adds magic to the latter in order to narrow down the chances of failure in economic activities or in love, to gain immunity from sickness and misfortune, and to remedy these contingencies when they do occur.

Virtues of Magic

In helping to increase man's self-confidence and sense of security when he lacks more precise scientific knowledge, magic undoubtedly performs a social service. Even the black variety, or *sorcery*, is not without its good side. Magic may be a powerful influence for social control ; a thief will be afraid to steal objects which he thinks may be magically protected In many societies the political structure is upheld by the belief that the rulers have great magical powers

COMPELLING THE RAIN. Among the Northern Australian aborigines an old man is chosen as principal "rain-maker." Here is one, with his two assistants, in his laboratory. His stones, troughs, pointing-sticks, and other objects, are important items in his equipment.

Divination

Magic is inextricably bound up with other practices. Magic and *medicine*, for example, are often difficult to distinguish. A *fetish* is a piece of ritual apparatus which is believed to contain a spirit and which can be used for much the same purposes as magic, good or evil Primitive societies have a great variety of techniques of *divination* or foretelling the future, and the result may give a man confidence in an undertaking upon which he is about to embark. Divination also is a way of explaining bad fortune—by giving supernatural or human reasons for it, and so indicating what steps shall be taken to end it.

HOMEOPATHIC MAGIC. This calf's heart, pierced with pins, thorns, and twigs, was intended to represent the heart of an enemy in a magical rite. It was found in a Dorsetshire cottage in 1902.

Witchcraft is another idea which is closely bound up with magic, but anthropologists—and Professor Evans-Pritchard in particular—have made witchcraft a useful technical term by limiting its meaning to one kind of phenomenon.

Witchcraft, like sorcery, is anti-social, but whereas sorcery is something involving magical rites, apparatus, and spells, and may actually be performed, witchcraft is entirely imaginary. The sorcerer exists, but the witch does not—except in the mind of the person who believes that it is possible for a human being to send some substance or spirit out of his body to attack his victim. This Course might well end with a description of some of the witchcraft beliefs of the Azande of Central Africa.

Misfortunes

For the Azande, witchcraft is an actual substance, a red or blackish swelling in the stomach which can be revealed by autopsy. The Azande believe that any person who has such a swelling can send out its soul or spirit into the night to injure other people. All deaths and most misfortunes—blighted crops, shortage of game or fish, loss of a wife's affection, accidents, etc.—are inevitably attributed to witchcraft.

This does not mean that the Azande do not know that failures may be due to incompetence, or that they are unable to recognize the direct cause of accidents. They understand, for instance, that the collapse of a granary may be due to the gnawing away of the supports by termites, but the fact that it should fall just when a man is sitting in its shade and kill him is attributed to witchcraft. The latter explains why a particular misfortune should befall a particular person at a particular time. It is a philosophy of natural causation.

Witchcraft and Good Conduct

It plays a part in the moral life, too, for witchcraft is associated with evil passions such as hatred, jealousy, greed, and envy. The person known to indulge such anti-social tendencies is more likely to be accused of witchcraft than one whose conduct is exemplary, particularly if the accused person has had a quarrel with his victim.

From this it follows that the fear of being accused of witchcraft is a powerful sanction for good behaviour, and as such it is particularly useful in small-scale communities where the collective well-being depends so much on at least a show of good relations.

Counteraction

Like sorcery, witchcraft provides an outlet for the expression of grievances and aggression and a way of counteracting them. For people who believe in witchcraft also develop a

NIGERIAN FETISH. This item of magical equipment is made up of eight human skulls, four human thigh bones, a hand carved in wood, a knife, a dagger, and an iron skewer.
Courtesy of Royal College of Surgeons

means of counteracting it. The Azande who believes himself attacked by witchcraft consults oracles or a diviner to smell out the witch so that the latter may be asked to cease and to make amends.

Witchcraft also has political significance, for although there are a number of oracles which can be consulted, the most important one, from which there is no appeal, is in the hands of the king and his representatives.

It all adds up to this: some at least of the practices and customs of primitive societies which at first sight seem absurd are more explicable when they are seen in the light of the relations between man and his environment and between men and men; when seen, that is, in the framework of the culture in which they occur.

Thus anthropology can encourage understanding and sympathy between peoples.

BOOK LIST

Physical. *Up from the Ape*, E. A. Hooton (Macmillan); *Introduction to Physical Anthropology*, M. F. Ashley Montagu.

Prehistory. *What Happened in History*, V. G. Childe (Penguin Books); *Archaeology and Society*, Grahame Clark (Methuen), and *From Savagery to Civilization* (Cobbett Press).

Technology. *Primitive Arts and Crafts*, R. U. Sayce (O.U.P.).

General Social. *Human Types*, R. W. Firth (Nelson); *Mirror for Man*, C. Kluckholn (Harrap); *Patterns of Culture*, R. Benedict (Routledge); *Habitat, Economy and Society*, D. Forde (Methuen); *The Economic Life of Primitive Peoples*, M. J. Herskovits (Knopf, New York); *The Golden Bough*, Sir J. G. Frazer (Macmillan).

Africa. *African Political Systems*, M. Fortes and E. E. Evans-Pritchard (O.U.P.); *Seven Tribes of British Central Africa*, E. D. Colson (O.U.P.); *Married Life in an African Tribe*, I. Schapera (Faber); *The Nuer*, E. E. Evans-Pritchard (O.U.P.); *Ashanti*, R. S. Rattray (O.U.P.); *Witchcraft, Oracles and Magic among the Azande*, E. E. Evans-Pritchard (O.U.P.); *Ibo Village Affairs*, M. M. Green (Sidgwick and Jackson); *African Worlds*, D. Forde (O.U.P.); *The Social Institutions of the Kipsigis*, J. G. Peristiany (Routledge).

America. *The Eskimos*, K. Birket-Smith (Methuen); *Smoke from their Fires, the Life of a Kwakiutl Chief*, C. S. Ford (O.U.P.); *The Crow Indians*, Lowie (New York); *The American Indian*, C. Wissler (O.U.P.); *The Aztecs of Mexico*, G. G. Vaillant (Penguin).

Asia. *A Japanese Village, Suye Mura*, J. F. Embree (Kegan Paul); *Peasant Life in China*, T'ung Fei Hsiao (Routledge); *The Todas*, W. H. R. Rivers (Macmillan); *The Andaman Islanders*, A. R. Radcliffe Brown (O.U.P.).

Australia. *The Arunta*, B. Spencer and F. J. Gillen (Macmillan); *The Australian Aborigines*, A. P. Elkin (Angus and Robertson); *Aboriginal Women*, P. Kaberry (Routledge).

Oceania. *Argonauts of the Western Pacific*, and *The Sexual Life of Savages*, B. Malinowski (Routledge); *Coral Gardens and their Magic*, B. Malinowski (Allen & Unwin); *Primitive Economics of the New Zealand Maori*, R. W. Firth (Routledge); *Coming of Age in Samoa*, Margaret Mead (Penguin); *Sorcerers of Dobu*, R. F. Fortune (Routledge); *Growing up in New Guinea*, Margaret Mead (Penguin).

PHYSICS

HEREIN *the bases of Physical Science are dealt with the nature and the behaviour of matter in all its forms, the so-called "Laws" by which men of science, philosophers, and discoverers have deduced the manner of operation of the natural forces --gravity, heat, light, sound, electricity, magnetism, radiation*

The student who has studied this Course will have covered in a general way, yet with considerable precision, the whole field of Physics He should pursue certain branches of the subject in other Courses : CHEMISTRY *in Vol. 1 for physical chemistry ,* ENGINEERING and ELECTRICAL ENGINEERING *in Vol. 5 for practical applications of heat and electromagnetism ,* MECHANICS *in Vol. 1 for theoretical developments and applications* MATHEMATICS *in Vol. 3 will provide him with material for further studies*

20 LESSONS

LESSON 1

Foundations of the Science

THE scope of Physics is really the study of nature ; in some universities, indeed, the subject is termed natural philosophy. The study of all natural phenomena covers a very wide field. The biologists take over that part which has to do with animal and plant life.

Apart from the help which is looked for in the development of these subjects the main work of the physicist is to study the inanimate, to formulate laws, and seek explanation of the events which take place in nature.

In general, the experimental physicist makes observations of the events which take place freely in nature, or which he causes to take place in apparatus designed for this purpose. As a result of these observations laws are formulated and theories are developed to account for the events

Then, perhaps, the theoretical physicist is able to make deductions as to what might happen under another set of conditions. These speculations are then tested by experiment, the results of which may give material for further deduction.

Phenomena Welded Together

This kind of development has gone on in the different parts of physics, and in these parts theories have been formulated. It has then been found that there is a similarity in the theories which have been suggested in various cases, and so correlation has been made possible between facts which otherwise seemed entirely disconnected. Then a wider theory has grown and embraced the many similar local theories, and a large group of phenomena have been welded together in this way.

Certain developments from time to time have led to the establishing of very definite methods of research, which have gradually formed parallel lines of study. In this way chemistry has been evolved.

Examination of modern chemical methods shows a very strong family resemblance to the parent subject ; the research methods of the chemist are rapidly reverting to the experimental methods of the physicist.

Practical Applications

Another factor has been operative in the formation of new sciences as a result of developments in physics. Some discoveries have been found to have a direct practical application, and so the practical sciences of mechanical, civil, and electrical engineering have grown up. An example is seen in the science popularly called radio. This has grown from what was regarded as a very effective laboratory experiment to a universally employed practical science as a result of the research work of physicists, who first of all discovered the basic facts and then tested them experimentally.

Province of the Physicist

The development of the principle discovered by Professor O. W. Richardson, that a hot wire emits electrons, is, of course, the thermionic valve, engineers as well as physicists have not been slow to realize the importance of the discovery. The practical development is the work of the engineer, but the investigation of the transmission of the radio waves from transmitter to receiver is very definitely the province of the physicist

Before the tremendous activity of the present century began it was often said that the physicist had no more to do than to measure known properties to " one more decimal place." Now the measurement to extreme accuracy is left to metrologists, the physicists being fully occupied in coping with new discoveries

The syllabus of a university course in physics is usually subdivided into the following parts : (1) mechanics, (2) general properties of solids, liquids, and gases, (3) heat, (4) sound, (5) light, (6) magnetism and electricity. Most of these subdivisions are more or less self-explanatory ; the first of them is not quite so obvious as the rest. It is dealt with at proper length in its own Course in *Vol. I*, and here it is only necessary to consider it as a foundation of the science of physics and applied mathematics.

Galileo's Experiment

If a body, a stone for instance, is allowed to fall freely to the earth it does so with ever-increasing velocity. We say that it falls because the earth pulls it towards itself ; and wherever one may be on the earth's surface the direction of fall is towards the centre of the earth Up to the time of Galileo (1564-1642), Aristotle's teaching, that the heavier the body the quicker it will fall freely to the earth, was apparently accepted without question.

Galileo devised a simple experiment to test the truth of this statement. A heavy and a light body were released at the same instant from the top of the leaning tower of Pisa, in Italy. The noise of impact of the bodies as they hit the ground was heard at the same time for both bodies, showing that the time of fall was the same. This simple experiment shows Galileo to be a true physicist and illustrates the importance of testing all theoretical speculations by direct experiment.

A question which arises from this experiment is : If all bodies are supposed to fall the same distance in the same time, how does one account for the vast time difference in the fall of, say, a feather and a piece of lead ? The explanation of the apparent contradiction is to be had from a consideration of another experiment.

A feather and a coin were placed in a long tube which was airtight, and the air was withdrawn from the tube by means of a suction pump. When most of the air had been withdrawn the tube was placed in an upright position and then quickly inverted ; the coin and the feather fell down the tube in the same time. So the observations of Galileo were confirmed.

In ordinary air the feather is resisted by the air itself ; in other words, the feather is not falling freely, and we are not observing the effects of the earth's attraction only. There are two forces acting on the feather, the one due to gravity, the other due to the air resistance ; but the air resistance is very small, so that with the heavy bodies the effect of the attraction of the earth alone governs their motion.

Constant Acceleration

If the fall of the different bodies is again considered, it is seen that they start together from rest and take the same time to fall the same distance, and from this fact it can be said that they acquire the same velocity, i.e. they travel at the same number of feet per second (or the same number of centimetres per second). Since the bodies started from rest it follows that the increase in velocity has been at the same rate for each body.

The increase in velocity per second is called the acceleration of the body, and so in summarising it can be said that all bodies falling freely to the earth do so with a constant acceleration, which is called the acceleration due to gravity. This has the value of about 32 feet per second per second, or 981 cm per second per second, i.e. a gain in velocity of 32 ft. per second in one second, hence the phrase per second per second or, as it is usually written, 32 ft./sec./sec., or g.

When it is stated that the acceleration due to gravity (g) is a constant, reference is made to the value obtained at one position on the earth's surface for *all* bodies falling there. As a fact, the acceleration due to gravity is found by experiment to have a value which depends on the location in which it is determined.

Variations in "g" Value

For example, at the equator its value at sea level is 978·03 cm./sec./sec., and at sea level near the north pole its value is 983·216 cm./sec./sec. A sufficiently refined method of measuring g would show that its value at the bottom of a very deep mine is greater than the value at the surface ; or, again, that the value taken at the summit of a high mountain peak is less than the corresponding value at sea level.

Over ordinary ranges of fall it might be considered as constant, but in the type of refined measurement to which reference has been made it does, in fact, vary. The farther the point where g is measured is from the centre of the earth, the less its value ; and, of course, the north pole is nearer the centre of the earth than is the equator, because the earth is not a perfect sphere but is flattened at the poles what is called an oblate spheroid. Some idea of the changes in g may be obtained from the following table :

Value of "g" at Different Places

Place	*Latitude*	*Value of "g"*
Pole	90 N	983·216 cm./sec./sec.
Aberdeen	57 8′ N	981·68 ,,
London	51 25′ N.	981·190 ,,
Portsmouth	50 48 N	981·136 ,,
Chicago	41 47 N	980·283 ,,
Equator	0	978·030 ,,
Cape Town	33° 56′ S	979·659 ,,

From these variations interesting results emerge, which can be better appreciated by first considering certain definitions and terms. We are every day in contact with matter , it is the very world in which we live. Matter has been described as that which occupies space, but really this only introduces another undefined term. All solids, liquids, and gases are made of different forms of matter. The amount of matter in a body is determined by the nature of the body itself.

Matter and Mass

For example, equal volumes of lead and cork do not have the same amount of matter. The lead seems to have more stuffing in it than the cork it contains a greater amount of matter. Associated with the amount of matter in a body is what is called mass. (Do not confuse mass with the weight of the body, which is really the attraction of the earth.) If the attraction of the earth on bodies was eliminated it would be found that they behaved differently in response to applied forces.

For example, if it was possible to reproduce, at will, a kick of a fixed amount and apply the kick in turn, for the same time, to a volume of lead which is resting on a smooth horizontal sheet of ice, and to a similar-sized piece of cork, it would be found that the cork would travel much farther than the lead. There is some inherent quality in the two substances which decides what will happen in a case such as the one described.

It is said that the substance has mass, and we associate the larger mass with the lead, which

goes the shorter distance on applying the force of the kick, or, to put the same thing another way, it would be found that to send the lead as far as the cork a much bigger force is required than for the cork.

The larger the mass the larger is the force required to produce a definite motion in the body. This quality of mass is something which remains constant wherever the body is. If the matter could be transplanted to the moon it would still have the same mass.

Newton's Laws of Motion

Newton, who was born in the year of Galileo's death, developed the work which the latter had begun, and formulated the laws of motion which are still the basic laws of mechanics. These laws may be stated as :

1 *Every body continues in its state of rest or uniform motion in a straight line, unless acted upon by impressed forces.*

2 *When acted upon by an impressed force, the rate of change of the quantity of motion is proportional to the impressed force, and takes place in the direction of the impressed force*

3 *To every action there is an equal and opposite reaction*

Law I indicates that force is that which tends to alter the state of rest or motion of a body The law itself seems to be the statement of the obvious. Illustrations will occur to the reader at once. As he sits reading he notices that a cloud of tobacco smoke has suddenly taken up a movement across the room : its state of rest has been disturbed. He turns round to see who has opened the door and allowed the air to act on the smoke.

As an illustration of the other part of the law, in which a body continues in the state of uniform motion unless acted upon by an impressed force, one might quote the experience of most persons at one time or another. In a railway carriage facing the engine which is travelling at a fair speed one moves at the speed of the train Should the train suddenly stop the traveller continues with his uniform velocity, and, if caught unawares, might very well be deposited at that speed on to the opposite seat.

The Second Law gives a precise definition of force. The term *quantity of motion* is an old form of the present term *momentum*. It really involves both the mass and the velocity with which the body is moving. The momentum is defined as the product of the mass (m) and the velocity (v), viz. momentum m v The Second Law says that force (F) is proportional to the rate of change of momentum, i.e. F is proportional to rate of change of (m v), and since m is constant, and rate of change means the change in unit time, or one second, it may be written :

$$F \qquad \text{change of } v \text{ per second}$$

But it has been seen that the acceleration, which is denoted by f, is the change of velocity per second, therefore F is proportional to m f. Incidentally, unit force is defined as "that force which, when acting on unit mass, produces unit acceleration," i.e. F mf.

If British measurements (i.e. foot, pound) are used, the unit force is called the *poundal*, and it produces in a mass of 1 lb an acceleration of 1 ft. per sec per sec. In many calculations and in most theoretical deductions the units used are centimetres, grammes, and seconds This system of units is called the C.G.S system. Here the unit of force is the *dyne*, and it is such that, when acting on a mass of 1 gm., it produces an acceleration of 1 cm per sec. per sec.

Reconsidering the illustration used in an earlier paragraph, which compared the effect of kicking a body made of lead and one made of cork, it amounted to the application of the same force to each mass for the same time The resulting acceleration and consequent velocity may be had from the foregoing equation, viz.

$$F \qquad mf \text{ or } f \qquad F \quad m,$$

i.e. the bigger the mass the smaller the acceleration imparted, hence the less the distance traversed or, alternatively, the bigger the mass, the greater must F be to produce the same acceleration

Another point which emerges from the law is that a direction is associated both with the force and the movement which results in its application Quantities like these, which require the statement of the direction as well as the size or magnitude, are called vectors, as distinct from such things as temperature, volume, etc., which are specified by their size only, and are called scalars.

LESSON 2

Gravitation Law in the Universe

It has been shown that a force is measured by the product of the mass of the body on which it acts and the acceleration it produces in that body. For example, a force of 200 × 40 8,000 dynes is required to produce an acceleration of 40 cm./sec./sec. in a mass of 200 grammes (also spelt grams).

Since all matter has mass and is attracted to the earth with an acceleration g cm./sec / sec., it follows that the earth attracts a body with a force which is g times its mass (m). This force is called the weight of the body,

and may be written as mg. Since g varies according to the position on the earth, the weight of a body varies similarly although its mass remains constant.

The weight of a body should, strictly, be measured in dynes, or in poundals, which are units of force. It is usually stated, wrongly, that the weight of a body is so many pounds or grammes, when it should be pounds weight or grammes weight.

Measured by Spring Balance

In the ordinary method of weighing, using a common balance, one compares the weight of standard masses (lb. or gm.) with the weight of the unknown mass. The earth pulls each side of the balance down, and adjustment is made of the weight until balance is attained. Here g is the same on both sides wherever the weighing is performed.

If, however, a spring balance is used, the force of attraction of the earth on an unknown mass extends the spring a certain extent and the weight is measured by the amount of extension. If this spring balance was taken to another place where g had a different value the extension of the spring would be different – the body would have a different weight.

Referring to the value of g given in the table in page 607, it will be seen that an object of mass m grammes would weigh 981·19 m dynes in London, and 980·28 m dynes in Chicago. Therefore if material weighed by a spring balance was bought in Chicago and sold by weight (as measured by spring balance) in London, there would be a greater weight to sell in London. The gain so obtained would be small but definite.

Newton's Third Law

According to Newton's Third Law of motion, action and reaction are equal and opposite. Therefore if the earth attracts a body of mass m with a force mg, it follows that the body attracts the earth with the same force. This is, in fact, a particular case of the law of gravitation.

All masses attract each other with a force of attraction which is proportional to the product of the masses (m and m^1) and inversely proportional to the square of the distance between the centres of the masses (d).

This force (F) can be written:

$$F = G\frac{m\,m^1}{d^2}$$

G is called the constant of gravitation. The law holds equally well for large bodies the size of the earth and moon and for small particles. So that if in an experiment it is possible to find the value of G for one set of masses it can be used for others of all magnitudes.

Thomas Cavendish, in 1798, made an experimental investigation of the attraction between bodies and was able to estimate G. Professor Poynting also carried out tests of this kind. A spherical mass of lead of about 20 kilogrammes (about 50 lb.) was counterpoised on a large sensitive balance, and a large sphere of lead of mass 150 kilogrammes (350 lb.) was placed just under the 20 kilogrammes: the attraction between the two caused a measurable increase in weight, F, which was found by adding weights to the other side. Since $m = 20{,}000$, $m^1 = 150{,}000$, and d the distance between their centres was also known, G was calculated from the foregoing equation.

Weighing the Earth

If the attraction between the mass m on the balance and the earth is considered, it is seen that if r is the distance between the centre of the earth and the centre of the mass m (i.e. r is equal to the radius of the earth), and if E is the mass of the earth, the force of attraction between m and E is the weight of m.

$$mg \qquad mE$$

$$G \; E$$

Now g can be accurately found by various methods, e.g. the compound pendulum. Hence, since G is known by the experiment previously described and since $r = 6{\cdot}37 \times 10^8$ cm., E was found to be about 6×10^{27} gm. ($10^2 = 100$, $10^3 = 1000$, etc., so that 10^8 means 100,000,000, 10^{27} means 1 and 27 0s.)

Work and Energy

Still dealing with fundamental ideas in mechanics, two more terms must be considered. These are *work* and *energy*. In physics, work is said to be performed only when a force moves its point of application. If a force (F) when applied to a body moves it a distance s in the direction of the force the work (W) is given as the product of the force × distance moved:

$$W = Fs$$

Work is therefore measured in units called foot-pounds.

If one tries to move a heavy box by pushing at it with all the force one can command, no work is said to be done on the box unless it moves. If by some means a heavy boulder is brought to the edge of a cliff, it is apparent that owing to the position it occupies the boulder could do work if allowed to fall over the cliff. This is expressed by saying that the boulder has *potential energy*.

Once the boulder is released it acquires velocity and now can do work in virtue of the motion it possesses. The boulder is now

said to have *kinetic energy*. This latter is actually measured by ½ the product of the mass (m) and the square of the velocity (v):

$$\text{i.e. kinetic energy} = \tfrac{1}{2} mv^2.$$

The definition of energy implied in the foregoing is the "capability of doing work." In the one case it is capable of doing work because of its position, and in the other in virtue of its movement. When the boulder is at the bottom of the cliff it can fall no lower and its potential energy is zero ; but at that instant the velocity is greatest--all the energy is now kinetic and is found to be exactly equal to the potential energy it had at the top of the cliff.

This is a particular example of a general law that if the energy changes its form it does so without loss. At all times there is a conservation of energy ; i.e. if the sum of the potential and kinetic energies is measured at any one time, this sum will equal the initial and also the final energy.

It would appear that in the case quoted there seems to be an end of the energy when the boulder hits the ground. It certainly has no potential energy, and because it is at rest it has no kinetic energy. It is found, however, that the equivalent of the energy appears in the form of heat. Always the last stage of such transformations is the appearance of the equivalent amount of heat. The earth has exactly the initial amount of energy at the end of the changes, but it is now expressed in another form.

LESSON 3

The Science of Hydrostatics

THE branch of Physics called hydrostatics deals with the general properties of fluids, that is, of liquids and gases, both of which have the essential property of fluids in that they flow, and must be placed in a containing vessel to prevent the flow.

Like any other form of matter fluids have density, i.e. each cubic foot has a definite weight in lb. weight, or each cubic centimetre weighs a definite number of grammes. Since they possess weight it follows that any surface within a fluid supports a weight, equal, in fact, to the weight of the column of fluid above the surface.

The bigger the area of the surface the bigger is the cross-section of the column of liquid supported and hence the bigger the weight supported. It is customary to express the effect in terms of the pressure that the fluid exerts. The term pressure is applied in all cases where we refer to the force acting on unit area.

Take, for example, a man skating on ice. His whole weight is supported on two small areas which represent the runners of the skates. The pressure, or force per unit area, is the weight of the man (expressed, say, in dynes, i.e. mass $\times$ g) divided by the area of the skates.

Similarly, considering a submarine under water, the pressure on the submarine, due to the water only, is the weight of the column of water on one square foot, or on one square centimetre. This is dependent on the depth below the surface of the water.

Actually it is equal to $g \times d \times h$, where g is the acceleration due to gravity, d is the density of the liquid, and h is the depth below the free surface of the liquid. (This is but another way of saying the weight of the column of liquid on unit area.)

The total pressure in the foregoing instance is due to the liquid plus the pressure arising from the air above the liquid, for the air having density has also weight and will make a definite contribution towards the pressure.

Atmospheric Pressure

Air seems a light enough substance, yet the pressure it exerts is really great. Living in the atmosphere of air we are subjected to a tremendous pressure, but the pressure inside and outside our bodies is the same--otherwise we should collapse. A simple experiment can be performed to show this.

Take a cylindrical tin oil can and place a little water inside. Boil the water on a gas ring and when it has boiled vigorously for a minute or so turn out the gas, and cork the can immediately.

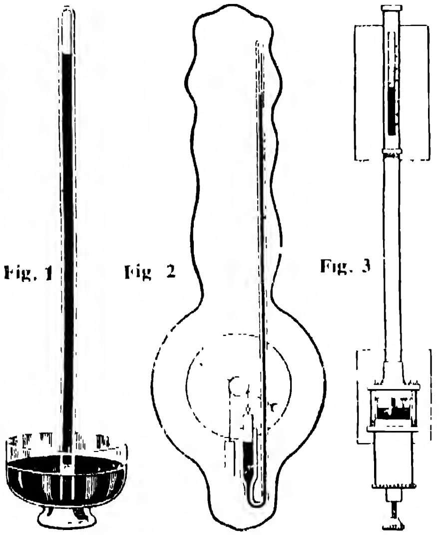
The air has been expelled by the steam, and as the can cools the steam condenses and leaves no air within. The pressure of the external air will cause the can to collapse in a crumpled heap.

A less destructive method of showing that air exerts a pressure is as follows. Fill a tumbler with water to the brim ; place a card on the top and, holding the card in position, invert the tumbler. It will be found that when the hand is removed the card remains in position apparently holding the water in the tumbler.

What is actually happening is that the air is pressing on the card, upwards, to the extent of the atmospheric pressure, i.e. each square centimetre has a very large force acting on it upwards—sufficient, in fact, to hold up a column of mercury 30 inches long—whereas on the other side there is the pressure of the water downwards. There is only about a six-inch column of water, so that the card keeps in position and the water remains in the glass.

To measure atmospheric pressure use is made of a barometer. In its simplest form the barometer consists of a glass tube about a yard long and half an inch in diameter. This tube is sealed at one end and is filled with mercury (quicksilver). The thumb is placed on the open end and the tube inverted into a bowl of mercury, the thumb being then released (Fig. 1).

The mercury runs down the tube a certain distance, but on an average day the column left in the tube is about 30 inches or 76 centimetres



BAROMETER TYPES. **Fig. 1. Mercury Bowl. Fig. 2. Siphon Fig. 3. Fortin Barometer.**

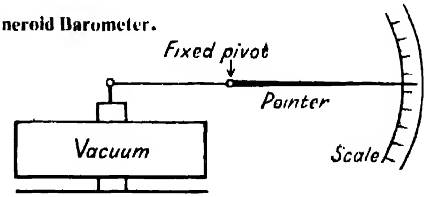
long above the surface of the mercury in the bowl. In the tube above the mercury there is no air, simply the vapour of mercury that exerts minute pressure.

The reason the mercury stays up is that on the outside the air is exerting a pressure on the surface of the mercury in the bowl. On the same level within the tube the mercury exerts a pressure which is equal to the outside pressure ; in fact, the height of the column adjusts itself until its pressure is equal to that due to the air. Any change of the atmospheric pressure results in a change of the level of the mercury column, and the barometer falls or rises.

To avoid the use of a bowl of mercury the siphon barometer, shown in Fig. 2, is often used. An iron ball floats on the wide tube and the rise or fall of this makes a thread rotate a wheel which moves a pointer over a scale graduated in inches. The accurate measurement of the atmospheric pressure is brought about by a modified form of the instrument illustrated in Fig. 1, called the Fortin barometer, Fig. 3.

The aneroid barometer, shown in Fig. 4, does not give the same accuracy, but can be used as a portable instrument. Its construction is evident from the diagram. The essential feature is a corrugated metal box, which is exhausted of air and the upper surface of which

Fig. 4. Aneroid Barometer.



is attached to a gearing which rotates a pointer for any movement of the top of the box. Increase of atmospheric pressure forces the box inwards, low pressure allows the box to move outwards.

Height of Ascent

If the pressure of the air is measured on such an instrument at the foot of a mountain and again by the same instrument at the top of the mountain it is found that there is a marked decrease in the pressure. This is obviously due to the fact that there is a shorter column of air at the summit—a difference exactly that of the height of ascent. In this way one could weigh the column of air or, alternatively, if one knew the way in which the pressure dropped for increase in altitude, the instrument could be used as an altitude measurer.

The drawback to its use in this way is the fact that change in the barometer due to weather conditions causes error in estimating height. For example, if the pressure of air due to movement of a cyclone caused a drop in the barometer at ground level it would give a fictitious increase in height as recorded on a barometer used as a height measurer.

Properties of Fluid Pressure

Summarising the more important properties of fluid pressure :

(1) In the C.G.S. units, pressure is measured in dynes/sq. cm. : it is equal to

$g \times d \times h$ where $g = 981$ cm./sec.^{2}, d is measured in grammes/cubic cm. (gm./c.c.), and h is the depth below the free surface of the fluid, measured in cms.

Dealing with liquids it is obvious where the surface is, but for gases, such as the atmosphere, it cannot be stated where the surface is, so the device called the barometer is used—a kind of weighing machine—and the pressure of the atmosphere is said to be equal to that of the column of mercury supported in the barometer by it. If the column of mercury is 76 cm. it is said that the atmospheric pressure is 76 cm. of mercury, or $76 \times 981 \times 13{\cdot}6$ dynes/sq. cm., since the density of mercury is 13·6 gm./c.c.

(2) The pressure in a fluid always acts at right angles to an area placed in it. At any point in the fluid the pressure acts equally in all directions.

(3) The pressure in one level of a liquid at rest is always the same.

Hydrostatic Press

Consider a U-tube containing water, as in Fig. 5, with one wide tube A and one narrow tube B. Suppose that A is 1 sq. ft. (144 sq. in.) in cross section, and that B is 1 sq. in. in cross section. If on a tight-fitting piston in B a weight of 1 cwt. is placed, the pressure is 1 cwt./sq. in. Under another tight-fitting piston in A the same pressure will be exerted at right angles to the area of the piston; the force on the piston in A is

$$144 \times 1 \text{ cwt. upwards - i.e. } \frac{144}{20} = 7 \text{ tons } 4 \text{ cwt.}$$

and this load could be supported without descending, i.e. it could be held up by the 1 cwt. in B. This is the principle of the hydrostatic press.

It is often called the hydrostatic paradox, because it appears as if more work was being produced out of the machine than was put in. If A is moved upwards by the addition of an extra load on B it is found that B has to descend a distance 144 times as great as the rise in A. The work done is the same and is not an exception to the principle of conservation of energy.

Fig. 5. Hydrostatic press.

Principle of Archimedes

When an object is placed in a liquid it either floats or sinks. If it floats it is said that the buoyancy is greater than the weight of the body. The buoyancy is the upward force on the body due to the pressure of the liquid on the under side of the body.

All bodies when placed in liquid appear to lose weight by an amount which is exactly equal to the weight of the liquid displaced by the body. This is called the principle of Archimedes. For example, a steel ship floats in water because the weight of the water displaced by the ship is equal to the weight of the ship itself. The size of a ship is usually expressed as so many tons displacement, which means the weight of water displaced is so many tons.

Of course, when a ship is loaded it weighs more and so sinks farther into the water, thereby displacing more water, until the extra weight of water displaced is equal to the load taken on board. The Plimsoll line on a ship marks the lowest limit to which a ship may sink in the water and yet be stable.

The same object placed in different liquid sinks to an extent which depends on the weight of the body and the density of the liquid. For example, if the density of paraffin oil is 0·8 gm./c.c., then each cubic centimetre of the body immersed will displace only 0·8 gm. of liquid. If the body weighs 80 gm. it will mean that

$$\frac{80}{\cdot 8} = 100 \text{ c.c.}$$

must be immersed in order that the body may float.

In water (density = 1 gm. per c.c.) the body will sink until 80 c.c. are displaced. The ordinary hydrometer is an instrument which is used to find densities. It consists of a glass tube loaded with a little mercury in one end to make it float upright; the depth to which it sinks is read on a scale within the glass stem, and this is graduated in densities.

The upward force called buoyancy acts when a body is in any *fluid*. In a balloon a large volume is filled with hydrogen or coal gas. This envelope displaces air, and the balloon is acted on by an upward force equal to the weight of the air displaced. If this is greater than the weight of the balloon and gaseous contents then the balloon will ascend. To lower the balloon the size is decreased by allowing gas to escape, thereby decreasing the buoyancy.

Boyle's Law

Gases very easily change in volume when acted upon by pressure. The Irish chemist Robert Boyle (1627–91) in 1662 found that if the pressure (P) acting on a gas be doubled, then the volume of the gas (V) is halved; or, saying this in a general way, $P \times V = \text{constant}$. The

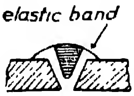
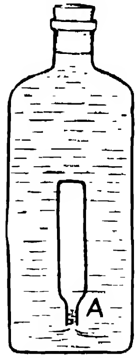


Fig. 6



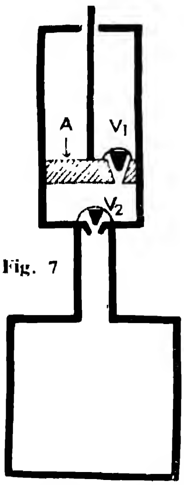


Fig. 7

Fig. 6. Effect of pressure on a gas. Fig. 7. Sectional view showing principle of a simple exhaust pump; inset, detail of valve in pump.

law applies to a fixed mass of gas kept at a constant temperature.

For example, if a glass tube of the shape shown in Fig. 6 containing air be placed under water in a closed bottle a little water enters, as shown at A. If the cork is pressed, the increase in pressure is communicated through the liquid and the gas decreases in volume, and so there is less water displaced. The buoyancy is less, and so the tube sinks if properly adjusted. If the pressure from the cork is released, the volume of air at once increases ; the buoyancy also increases and the tube rises.

Boyle's law applies also in connexion with a simple exhaust pump, Fig. 7 A represents a piston moving freely in a cylinder and containing a valve V_1. The cylinder has a valve V_2. When the piston moves upwards the volume of the apparatus is increased by the volume of the cylinder, and so the pressure gets less No air enters during this process, as V_1 closes because of the great pressure above it. When the piston returns V_2 closes and the air in the cylinder is compressed, V_1 opens and this air is expelled ; then the whole motion is started again with a reduced mass of gas at a reduced pressure.

In a compression pump, such as that used to pump up tyres, the valves work the other way—i.e. they are again cones, but with the points upwards. At the top of the stroke a volume of air is in the cylinder. When the piston is pushed down the increase of pressure within the cylinder closes V_1 and opens V_2. The air is pushed into the tyre. On the upward stroke V_2 closes as a result of the pressure within the tyre being greater than the partial vacuum in the cylinder, and V_1 opens. Air again fills the cylinder and the process is repeated.

The ordinary water pump is designed on the lines of Fig. 7. The tube from the cylinder goes down to the water supply and the reduction in pressure causes the water to rise up in it. This water is expelled from a side tube through another valve It is obvious that when the pump is working it creates a vacuum in the space above the water.

In this way the greatest height, H, to which the water may be raised is that of a water barometer—i.e. when the column of water raised has a pressure on the underground water supply equal to the atmospheric pressure. This is given by the equation :

$$g \times H \times 1 = g \times 76 \times 13.6 ;$$
$$H = 76 \times 13.6 = 1{,}033.6 \text{ cm, or about } 40 \text{ ft}$$

LESSON 4

The Properties of Liquids

If one watches the formation of a drop of water at the end of a tap which is very slowly dripping it will be observed that the water collects as a drop in well-defined stages, making it appear as though an invisible elastic bag were attached to the tap In fact, if a large thin sheet of rubber be stretched and water allowed to accumulate within it the bag so formed will alter its shape in exactly the same way as the drop of water on the tap.

This suggests that at the surface of the water there is some effect similar to an invisible membrane Such a membrane does not actually exist but, as is shown later, there is a surface effect in all cases of separation of liquid from gas.

Spheres and Globules

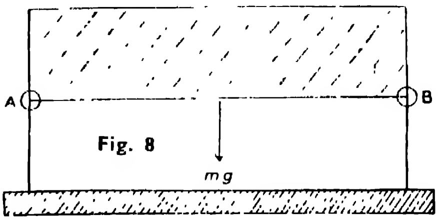
If water is allowed to drop on to a clean wooden table it spreads over the surface of the wood. It is said that the water wets the table. Technically, a liquid wets a solid when it spreads over it ; there seems to be none of that invisible skin effect found in this simple experiment.

It is equally well known that if water is dropped on to a greasy wooden surface the water does not wet the surface but piles up into globules. Very small quantities of water seem to make perfect spheres of water on the surface ; large quantities of water make flattened spheres. In this case there is once more evidence of the surface behaving as though constrained by some invisible outer cover.

Parallel Pull

The term *surface tension* is used to describe the properties of liquid surfaces which the foregoing simple experiments illustrate.

In a liquid surface there is a definite pull parallel to the surface. A simple experiment can be performed to show that the pull is present



SURFACE TENSION. Fig. 8. Experiment with soap solution.

and to get some idea of its value. A piece of clean iron or copper wire is bent into the shape of a goal post (about 4 in long and 2 in tall). The two ends are pushed into a piece of wood in order to hold the posts upright. A movable crossbar, AB, is attached freely to the uprights,

so that in the ordinary way it will slide down the posts by its own weight when released at the top. A saturated soap solution is made and the frame is placed in the solution so that a film of soap solution is formed, as shown in the shaded part of Fig. 8. It will be found that the soap film pulls the rod AB up the post, i.e. there is a pull in each surface of the film co-planar with (in the same plane) and towards the centre of the film.

The surface tension is defined as the force, in dynes, acting on each centimetre of length on the rod AB, parallel to the surface, e.g. if the rod is loaded until it just remains stationary, and the loaded rod has a mass m, there is a pull down of $g \times m$. The pull upwards is $T \times l$ on each surface, making a total force of $2Tl$, where l is the length of AB in centimetres and T is the surface tension, so T can be simply calculated

Two Surface Tension Pulls

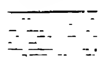
In the ordinary way it is clear that a fairly dense substance like steel will sink in water, yet under suitable conditions steel can be made to float. Place a steel sewing needle on a thin piece of blotting paper which is on the surface of clean water. In time the blotting paper will sink and leave the sewing needle floating on the water. What happens is the effect of surface tension.

Fig. 9. The floating needle.

The water will not wet a sewing needle, especially if it has been slightly greased by rubbing it between the fingers. The result is seen in Fig. 9, which shows the section of the needle depressing the water and thereby causing two surface tension pulls in the directions of the arrows. If the needle is not too heavy it will be held to the surface by these two forces. If the needle is made to break through the water surface it will immediately sink.

Capillarity

One result of the surface tension of liquid is the phenomenon termed *capillarity*. If a clean glass tube with a very fine bore is placed in water it is found that the water rises up the tube against the effect of gravity. The smaller the inside diameter of the tube the higher does the liquid rise. The reason can be seen with the help of Fig. 10 Water wets the glass of the tube, and so, as shown by the arrows, there is a force all round the tube walls, pulling upwards , the result is that the water goes up until the water thus raised weighs exactly as much as the surface tension pull.



(a) (b)
Fig. 10

Different types of meniscus formed by a capillary tube in (a) water and (b) mercury.

The *meniscus*--the cup-shaped surface at the top of the water-- is a result of the surface tension. If the liquid did not wet the surface the meniscus would be as in Fig. 10b, where the surface tension depresses the liquid. This will be recognized as the shape of the mercury meniscus in a barometer tube.

Blowing Bubbles

A simple experiment on surface tension is bubble blowing. The formation of ordinary soap bubbles is governed entirely by the effect of surface tension. It can be shown that the radius, r, of the bubbles blown is dependent on the pressure, p, within and the value of the surface tension, T, in a way which can be written :

$$\frac{p}{r} \quad 4T$$

i.e. the bigger the bubble the less the pressure. This seems wrong when the extra blowing required to produce the big bubbles is remembered but it can be shown to be a true statement, for if two bubbles are joined together--a big one and a little one--it is found that the little one, having a greater pressure within it, blows the big bubble up farther and gradually disappears itself.

Camphor Action

The value of surface tension rapidly decreases when the liquid is contaminated with grease or dissolved impurity. If a little dusting powder is scattered over the surface of water and then the surface is touched at a point with a greasy pencil, or with a rod of caustic soda or camphor, it will be found that the surface is pulled away from the point of contact, showing that the surface tension of the contaminated region is less than the rest. The same thing happens with a rubber balloon if the rubber is weakened at one point The parts surrounding it pull away from that point and the balloon bursts.

If you make a paper boat, attach a piece of camphor to one end, and place it on water, it will be found that the boat moves forward, just as if the camphor were pushing it. The camphor is dissolving. It is making a solution which has a lesser surface tension, and it is the strong surface tension of the pure water which pulls the boat forward. In time, when all the water is contaminated, i.e. when there is a uniform solution, the movement will cease.

Modern detergents and soapless powders reduce the surface tension of greasy and dirty water and thus make the water more "wet," allowing it to spread more efficiently over the article to be washed.

LESSON 5

Introduction to the Molecular Theory of Matter

If a small volume of ammonia is released in one corner of a large room it is a matter of minutes only before the smell of the gas reaches the opposite corner. This transference of the gas takes place when the air of the room appears to be quite still, so that it is not brought about by a regular movement of the air. The gas is said to be *diffused* through the air.

A similar process takes place when the gas is separated by a porous membrane. For example, if a porous pot is taken, such as is used in electric cells, and it is filled with coal-gas and corked up, it is found that the gas escapes through the pores at a quicker rate than the air enters, and consequently the pressure inside is reduced.

Diffusion in Liquids and Solids

The process of diffusion is not confined to gases only, as can easily be shown by experiment. A clean glass jar is half filled with water and, by means of a funnel which leads to the bottom of the water, a concentrated solution of blue copper sulphate, which is heavier than water, is poured gently to the bottom of the jar. If this is done carefully, there will be two distinct layers in the jar. The lower one is blue, the upper colourless. If the jar is examined after some days it is found that the surface of separation has become indistinct and has moved upwards.

The penetration of the blue copper sulphate upwards has been brought about against gravity, so that the possible explanation in terms of gravitation is eliminated. This is an example of diffusion in liquids. Eventually the copper sulphate is diffused throughout the whole liquid.

In solids, diffusion takes place at a very slow rate. Lead and gold blocks which were resting together at the Mint for some years were found to have inter-diffused. Thus it is seen that diffusion takes place in all forms of matter, the distinguishing feature being the time taken. In gases it is usually a matter of minutes, but the heavier the gas the longer the time ; in liquids it is a matter of days, and in solids years, to produce a small measurable effect.

Osmotic Pressure

Osmosis is the tendency of fluids separated by a membrane, or other porous substance, to percolate through that substance and mix. It is a most important phenomenon and can be best explained in terms of a simple experiment. A long glass tube is taken and at one end, which widens out, a sheet of parchment is stretched and fastened to the rim of the tube, to make a drum-like seal to it. A thistle tube serves well for this purpose.

The tube being held vertically with the parchment at the bottom, the container so formed is filled with a strong sugar solution, so that the surface of the solution in the tube can be marked. When the parchment end of this tube is immersed in a glass of clean water it is found that the level of the liquid in the tube gradually rises.

This is due to osmosis. What happens is that water enters through the membrane, making the solution weaker but definitely raising the column against the effect of gravity, and so producing an increasing pressure on the membrane.

If the tube is long enough it will be found that in time the liquid within the tube comes to a level at which it remains constant. The pressure so created is called *osmotic pressure*. If two sugar solutions of different strengths are used the solution inside will rise if it is stronger than that outside. There is always the movement of the water tending to equalise the strength of the solutions, and thereby increasing the pressure opposing further change.

Biological Importance of Osmosis

This process of osmosis is of extreme importance to all living cells. It accounts for the movement of sap in the cells of a plant, and it is one of the factors in the rise of sap up tall trees against the pull of gravity. If dried currants are placed in water it is found that they swell and become rounded ; this is due to water entering by the process of osmosis. In human beings, too, osmosis plays a role. The alimentary tract and the blood stream are contained in membranes which allow the passage through their walls of solution when the difference in concentration is suitably arranged.

Speculations as to the nature of matter began long before the Christian era, and are still being made. The theories can now be tested because there is a large mass of experimental data against which to check them.

Ultra-Microscopic Particles

Two theories concerning matter alternated in favour. According to the first, matter is infinitely divisible ; no matter how small a piece of it is taken it retains its individuality. If, for instance, a piece of iron is cut into small pieces, however small the pieces are made they have the properties of iron.

In answer to the question, " What happens in the limit when ultra-microscopic particles are being dealt with ? " the upholders of this theory maintained that we should still have iron, and the process could go on indefinitely. According to the other school of thought, this process of

division would lead to a unit which is the smallest portion of that kind of matter which could exist as such.

This unit is regarded as differing from element to element, and is called the *atom* It has the property of not being chemically divisible and yet retaining the property of the element concerned. In compounds the unit is the *molecule*, which is made of a group of different atoms, just as the molecule of an element is made of one, two or more atoms. When the molecule repeats itself many times the accumulation is the matter around us.

This theory is the one which seems to fit the observed experimental fact to the nearest degree of approximation. The old idea was to regard the molecules as solid elastic spheres, but, as is shown later, this has been considerably modified in recent years. For the moment the structure of the atoms or molecules will not be considered, but they will be regarded as extremely minute particles

The number of molecules in a cubic centimetre of a gas at normal pressure and at 0° C. is assessed at about 3×10^{19}, or 30 million million million. This number is too large to comprehend, but when it is remembered that the size of the molecule is 10^{-8} cm in diameter it is realized that there is plenty of room between the molecules

Random Velocity

When discussing gravitation in Lesson 2 it was shown that all matter attracts matter with a force that can be calculated from the equation given : it is clear that if this attraction were the only force acting all the molecules would gravitate together and, in spite of their number, would form a solid mass in the space Actually it is known that this is not so. The experiment on diffusion in gases which was quoted earlier in this Lesson definitely disposes of this.

The extra factor which is introduced is a *random velocity*. All the molecules move about in a haphazard manner with a velocity which is really great. If our attention is confined to a single molecule it is seen that it will fly off in a definite direction until it hits a second molecule, which will cause it to change its direction. This process will be repeated at every collision At any given pressure the average distance a molecule will go without having a collision is constant ; it is called the *mean free path*.

When the pressure is reduced, as inside an ordinary valve, the mean free path might be as long as 10 to 25 cms., but at atmospheric pressure it is a fraction of a centimetre. It is further known that each cubic centimetre of gas has a definite mass, so that if the number of molecules in that centimetre is known the mass per molecule may be found.

When a gas is turned to liquid its volume becomes very much smaller, and so the molecules do not have the same freedom of movement they have a greater influence on each other. In the change to solid state it is found that the molecules are usually packed closer together, and now their mutual attractions become a very important factor.

For example, in a steel wire holding up a 2-ton load the attraction between molecules in the wire is at least equal to the pull of the earth on the 2-ton load, otherwise the molecules would separate ; more simply put, the wire would break

Therefore, according to the accepted molecular theory, the molecules have a random velocity which is great. In spite of the very large number of molecules per cubic centimetre (c.c.) of a gas at normal pressure and 0° C there is a large space between them as they are so very small. The average distance between successive impacts, the " mean free path," depends on the pressure of the gas

If the molecule has a mass and moves with a velocity it also possesses momentum (mv). Consider a gas kept in a closed space : the molecules will hit against the walls of the space and so have their momentum changed. The rate of change of momentum is force, so that on each unit of wall area of the containing space there will be a pressure which is equal to the change in momentum on that area per second. If the volume is halved there will be twice the number of molecules per c.c., and consequently twice as many hits per second, and consequently twice the pressure This is the case, and it is stated as Boyle's Law.

Molecular Behaviour in Liquids

The molecules of one sort—say, oxygen—all have the same mass (with exceptions described later when considering isotopes), and if the temperature remains constant they have an average velocity which has a definite value If the temperature is raised the result is an increase in the average velocity of the random movement of the molecules. The same applies in liquids. The closer associated molecules have an average random speed which depends on the temperature ; the velocity of individual molecules may be much greater or less.

When a molecule moves in a liquid it also has collisions, and, as in gases, the result is a rebound in another direction, or a spin is given to it as well as a movement in a straight line. The attractions between the molecules balance out, as there is a pull equally in all directions. But when the molecule approaches the surface the attractions no longer balance out.

Imagine that an instantaneous picture of one molecule shows it just on the surface : it seems clear that there is a big pull from the molecules under it, which is not compensated by a pull

from above, where there is no liquid. The result is a pull back into the liquid. In fact, it makes the surface appear to behave as if it were a membrane.

If a small drop of water be suspended, then the pull on the surface molecules is inward, directed to the centre, and the water forms a drop of spherical shape in consequence. These will be recognized as two of the effects discussed in dealing with surface tension. Most of the surface tension effects can be similarly explained.

Considering the water surface, it is obvious that if a molecule could arrive at the surface with sufficient speed it could overcome the attraction of the remaining liquid and break through the surface. Once away, it is free moving and is said to form a vapour. It is what actually takes place in evaporation

One thing which should follow, since it is the quickly-moving molecules which are able to get out of the liquid, is that the remaining liquid should have a lower average velocity --or the liquid should be cooler, since the temperature depends on the average speed. This effect is very noticeable if a little ether or petrol is placed on the hand. The rapid evaporation produces a marked cooling effect.

In solutions the molecules of the solids intermix with those of the liquids, which are usually smaller If a solution is against a wall containing very minute holes, the chance of a water molecule getting through a small hole is hindered by the presence of the larger solid molecule. Therefore, if on two sides of such a partition there is pure water and solution respectively, there is a better chance of pure water passing to the solution than of water of solution passing the other way. In fact, osmosis is to be expected.

Brownian Movement

If a solution of ordinary gamboge water colour be viewed through a high-power microscope it will be found that the granules or particles of gamboge in suspension move about in a most erratic manner. This movement is called *Brownian movement*, after Robert Brown (1773 1858), a Scottish naturalist. The same kind of thing can be observed with gum arabic and other substances.

After elimination of all other possible explanations of the movement it was established that it was due to the liquid itself and not to any outside cause. It is definitely established that what is seen is simply due to the uneven bombardment of the gamboge granule by the molecules of the liquid. The granule happens to be hit on one side only by a molecule and moves away. Then another molecule hits the granule and sends it in some other direction, and so on.

If the granule is very large the chance of this erratic movement being imparted to it by molecular bombardment is much smaller. This is due to the fact that as the granule becomes larger it receives a greater number of direct hits by molecules coming from all directions, and the result is no total force on it in any direction. Even with a large granule an occasional chance of an unbalanced impact occurs When large objects are considered this chance of Brownian movement becomes very small.

Mean Free Path

Jean Perrin (1870 1942) made experimental studies of Brownian movement and was able, by applying relatively simple mathematical treatment, to calculate from his observations the number of molecules per cubic centimetre, the mean free path, etc. Albert Einstein (1879 1955), famous for his theory of relativity, also made it possible to find molecular constants from observations of the *positions* of the granule after measured times.

The mathematics there is similar to the problem of finding how far a drunken man would go if he started in a given direction and then fell. After each fall he gets up and starts again in a random direction and has a " mean free path " between falls. It can be shown how far he will go from his starting point by calculation analogous to that used for the random-moving granules. The granules are *seen*, movement is measured, and molecular constant calculated.

If at one temperature the average velocity of the molecules is fixed, the average kinetic energy ($\frac{1}{2}mv^2$) is also fixed. To raise the temperature of the substance the kinetic energy of this random movement must be increased; and the only way of doing this is by supplying the equivalent of the energy gained. In other words, work must be done equal to that gained. It is said that heat has been supplied. Therefore it can be stated that heat is a form of energy.

In the old days heat was thought to be a massless fluid called *caloric*, which passed from the fire to the body, whose temperature was raised. But it is known that by doing work heat can be produced. For example, if a piece of wood is rubbed on a table a regular movement is imparted to the molecules of the wood ; the friction between them has been overcome and the work so done converts the regular movement into random movement of the molecules, and the temperature goes up. This was verified in the classical experiments of the British physicist J. P. Joule (1818 89) who showed that every 42 million ergs of work, if all converted to heat, produced one unit of heat, called the *calorie*.

The calorie is the unit used to measure heat and is the amount of heat which will raise the temperature of 1 gramme of water through 1° C. The relation is called " the mechanical equivalent of heat," or " Joule's equivalent," and it is written in the form $4{\cdot}2 \times 10^7$ ergs per calorie.

LESSON 6

Heat as the Physicist Studies It

CONSIDERATIONS of the molecular theory in the preceding Lesson lead one to associate with the temperature of a body the mean kinetic energy of the molecules of that body, but this does not lead to a very ready method for the measurement of temperature.

Defined as the " degree of hotness " of a body, temperature is usually measured by means of a thermometer. Quantities of heat are measured in terms of the calorie ; temperature, or heat level, is measured in terms of an arbitrary scale of temperature. The Fahrenheit scale serves in everyday use, engineering, and medicine , the Centigrade scale is used for scientific purposes.

Temperature Measurement

To establish a true scale of measurement of temperature any physical property which varies regularly with temperature is taken ; then the magnitude at two fixed points is found and the change is subdivided into a convenient number of divisions.

To make this clear, let us see how the Centigrade scale is actually defined in a mercury thermometer. The expansion of mercury in glass is selected as the physical property (substances increase in size as the temperature rises). When the thermometer is placed in melting ice the mercury remains at one volume so long as any ice is left , the level in the thermometer stem is noted and is taken as the lower fixed point. When the water and ice mixture is heated the mercury expands and rises up the stem as soon as all the ice is melted ; this goes on until the water boils, when again no further increase in volume and consequent rise occurs.

This level of the mercury in the stem is taken as the second fixed point. Actually the stem of the thermometer should be in the *steam* from the boiling water, and the pressure should be 76 cms. of mercury.

Melting Ice and Boiling Water

The distance on the stem of the uniform bore tube of the thermometer between these points is then divided into 100 parts, and each division is called a degree Centigrade. It is merely a matter of agreement—any subdivision could have been taken.

For example, the Fahrenheit scale is made by calling the melting ice level 32° F. and the boiling water level 212° F. ; there are thus 180° F. between melting ice and boiling water, corresponding to the 100° on the Centigrade scale.

These thermometers are suitable for the measurement of temperatures from near the freezing point of mercury to near the boiling point of that liquid. For accurate work the expansion of air is used in the " air thermometer," and for high temperatures the variation of other physical properties is made use of.

Physical Units of Heat

In Lesson 5 it was shown that heat is a form of energy ; that if mechanical work be all converted to heat one can calculate the heat produced by making use of the " mechanical equivalent " as found by Joule in his classical experiments, viz. $4{\cdot}2 \times 10^7$ ergs per calorie. In such calculations, as will be shown later, large numbers are dealt with and so a larger unit of work than the erg is often used, called the *joule*, which is 10^7 ergs. In this unit the mechanical equivalent is 4·2 joules per calorie.

To form some idea of the amount of work required to produce one calorie, consider a pan containing about 1¾ pints of water at room temperature 20° C. Heat is supplied by a gas ring, and the water is gradually brought to the boiling point (100° C.). Now 1¾ pints are approximately equal to 1,000 c.c.s (1 litre), so the heat taken from the gas flame is found to be 1,000 × rise in temperature = 1,000 × 80 calories. This is equivalent to $80{,}000 \times 4{\cdot}2$ joules, or $33{\cdot}6 \times 10^{11}$ ergs.

To realize what this means, consider what mechanical task could be accomplished by the work. For example, suppose it is applied to lifting a 3-ton rock. The work would be used in giving the rock a potential energy $m\,g\,h$, where h is the number of feet the rock is raised, i.e. since

1 ton = 1,016,000 gm. and 1 ft. = 30 cms., therefore :

$$(3 \times 1\,016{,}000) \times 981 \times (h \times 30)$$
$$= 33{\cdot}6 \times 10^{11} \text{ or } h \text{ is just over 37 ft}$$

It seems rather astounding that the energy required in such a commonplace operation as boiling 1¾ pints of water could, if suitably applied, lift 3 tons from the ground to the top of a tall wireless mast.

Specific Heat

If substances other than water are considered it is found that the heat required to raise the temperature of 1 gm. 1 degree Centigrade is not 1 calorie. For copper it is about 1/10 cal., for paraffin oil about 1/2 cal., and so on. It is said that the *specific heat* of water is 1, of copper 1/10, of paraffin oil 1/2, etc.

This is well exemplified in sand and sea water. When both are exposed to the intense heat of the sun for the same time the sand, being of low specific heat, becomes much warmer than

the sea water, a fact verified when one is bathing on a summer day.

For large-scale phenomena, where mass is measured in pounds and temperature in degrees Fahrenheit, a larger heat unit is used, called the British Thermal Unit (B.Th.U.). This is the amount of heat required to raise the temperature of 1 lb. of water 1° F.

Therm Explained

For example, on the reverse side of many gas bills the heating power of the gas supplied is expressed as so many, say x, B.Th.U. per cubic foot. This means that if 1 cu ft. of the gas were burnt under conditions of complete combustion x B.Th.U. would be obtained. As has been shown, this is equivalent to a definite amount of energy.

Therm is the name given to the unit of supply of gas in terms of the B.Th.U., and is equal to 100,000 B.Th.U.; so that if the consumption of gas is 1,000 cu. ft., and each cu. ft. happens to be equivalent to 470 B.Th.U. under the conditions stated, the number of therms is:

$$\frac{470 \times 1000}{100{,}000} = 4.7 \text{ therms}$$

The excellence of this method of gas supply is that, if the calorific power of gas varies, the payment is still for the thermal equivalent of the energy, as the number 470 is adjusted by the suppliers to be equivalent to the actual heating value of the gas supplied.

What Becomes of the Heat

If a thermometer is put into a pan containing ice and water it reads 0° C., and if the pan is placed on a gas flame the temperature remains the same until all the ice is melted. Then there is a rise in temperature until the water boils, when again the temperature remains constant until all the water is boiled away. The gas flame supplies heat all the time, and the question arises, what becomes of the heat when the thermometer stands at 0° C. and at 100° C.? In terms of the molecular theory the answer is not far to seek.

The molecules of ice, changing to water, are split apart to be more free-moving and there must be a certain amount of work done to overcome the attraction of the molecules to each other. The mechanical equivalent of the heat is used on this separation.

Latent Heat

So work is done tearing the water molecules apart to make steam; only more work is required, because in the gaseous state the molecules are free entirely. The heat supplied is said to be *latent* or *hidden*. Each gramme of ice at 0° C. changing to water at 0° C. requires 80 calories (approx.).

In the same way, if 1 gm. of water at 0° C. changes to ice at 0° C. there is a liberation of 80 calories. It is said that the *latent heat of fusion of ice* is 80 cals. per gm. In the change from water to steam each gramme of water at 100° C. requires 540 cals. (approx.) to convert it to steam, and in the reverse operation each gramme of steam gives up 540 cals. on condensing to boiling water. The *latent heat of evaporation of water* is said to be 540 cals. per gm.

Severe Scalding

The high value of the latent heat of evaporation of water is seen in the severe scalding which takes place if the hand is placed in steam. The condensation of the steam on the hand is brought about with a consequent liberation of 540 calories for each gramme condensed to boiling water. If a gramme is condensed and cools to 20° C. the number of calories is 540 + (100 − 20) = 620, whereas if the hand had only 1 gramme of boiling water poured on it the heat received would be only 100 − 20 = 80 cals.

Whenever a change to vapour from liquid takes place it is always necessary to supply heat equivalent to the latent heat. The lower the temperature at which the change takes place the smaller is the latent heat; in all cases, as was shown in Lesson 5, the existence of latent heat could be anticipated from the molecular theory.

Linear Expansion

When the construction of a mercury thermometer was considered it was assumed that there is an expansion of the mercury when the temperature rises. It is known as a matter of common observation that most substances do indeed change in size under these conditions of temperature change. The gap left between lengths of railway lines to allow for expansion in hot weather is a simple application.

The exact increase in length of a substance is usually expressed in terms of what is called the *coefficient of linear expansion* (α), which is defined as the increase in length of 1 cm. at 0° C., when heated through 1° C. The coefficient of linear expansion of iron is 0·000012 per degree Centigrade. That is, the fractional increase per degree Centigrade rise is 0·000012.

If the length of metal rod is l_0 at 0° C., the increase in length at t° C. is $\alpha l_0 t$, and therefore the new length, l, at t° C. is $l_0 + \alpha l_0 t = l_0 (1 + \alpha t)$. Thus, if the value of α is known the changes in length when the temperature changes can be calculated. To facilitate such calculations tables of constants are available, in which are tabulated the coefficients of linear expansion of different substances. Each figure in the table has been found by a set of experiments on the substances.

An application of this kind of expansion is seen in the pendulum of a clock. The time of swing, T, of a simple pendulum, is the time for a

complete swing there and back again—and is equal to

$$2\pi\sqrt{\frac{l}{g}} \text{ where } \pi = 3{\cdot}1 \text{ (approx.)}$$

and g is the acceleration due to gravity, and l is the length of the pendulum.

In summer the length l increases and so T increases, and therefore the clock does not make as many swings in a day as in cold weather in other words, the clock "loses" in summer. In most clocks the pendulum is not a simple one—i.e. a heavy very small mass on a light cord—but is compound: there is a *rod* which carries a massive bob.

Fire Alarm Application

The same type of change occurs in its time of swing, however, and it is often corrected against temperature changes by allowing the bob to be free moving against an end stop on the rod (Fig. 11). When the rod expands the centre of mass of the bob is lowered, but at the same time the bob, which is made of a substance having a large coefficient of expansion, expands upwards to a greater extent and is arranged so that the centre of gravity just keeps the same distance from the point of support, and thus keeps the same time of swing however the temperature changes.

There are devices which make use in other ways of the differences in the linear coefficient of expansion of metals. If a strip of iron (α = 0·000012 per °C.) and a strip of brass (α = 0·000018 per °C.) of the same dimensions are riveted together it will be found that at a higher temperature the compound strip takes up a curved form: the brass, expanding more than the iron, is on the outer side of the curve. This principle is made use of in such things as fire alarms, where the rise in temperature causes a double strip to bend and close an electric circuit and so cause an alarm bell to ring.

The same principle, using other metals, is adopted in the compensation of balance wheels of watches and clocks against temperature changes (Fig. 12). The rim which contains the bulk of the mass is divided and made of a compound strip whose more expansible component is on the outer side.

For a rise in temperature the rim moves inward, and thus the mass moves nearer the axis of oscillation. Offset against this is the outward expansion of the spokes. It is adjusted to secure complete compensation.

Cubical Expansion

Liquids and gases expand to a greater extent than solids. Moreover they introduce a new feature for they must be contained in a vessel made of some substance which also expands. The measurement of the expansion is therefore not as straightforward as in solids. For example, if an expansion of a liquid in a glass vessel is observed there is the expansion of the vessel, tending to make the liquid appear to take up less space, and then the expansion of the liquid increases its size. So if the net result is seen, it is the real expansion of the liquid minus the expansion of the containing vessel.

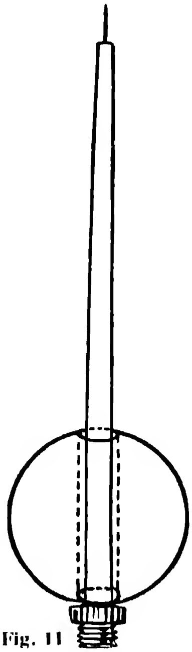


Fig. 11

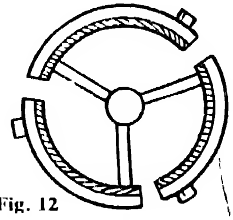


Fig. 12

EXPANSION OF METAL. Fig. 11. Pendulum safeguarded against rise of temperature by free-moving bob. Fig. 12. Balance wheel of watch with expansible rim.

In volume changes the expansion is expressed by means of a coefficient called the *coefficient of cubical expansion*. This is the volume change per unit volume for 1° C. rise in temperature, e.g. if a volume V increases by an amount v when the temperature is raised by t °C., the coefficient of cubical expansion is $\frac{v}{Vt}$.

For the liquid just considered there are two coefficients of cubical expansion; the first is the *real coefficient of expansion*. When the rise of a liquid in a vessel is measured, it has been shown that the observed amount is less than this, and the corresponding coefficient is called the *coefficient of apparent expansion.*

The vessel expands as though it were solid, and the coefficient of cubical expansion for the solid material is very nearly three times the linear coefficient. Therefore: the coefficient of real expansion = coefficient of apparent expansion + coefficient of cubic expansion of the glass of the vessel.

To see the difference in these two coefficients, consider water in a glass vessel. The real coefficient is 0·00015 between 10° and 20° C.; for glass the linear coefficient is about 0·000007; the apparent coefficient for water in glass is 0·00015 − 3 × 0·0000017 = 0·0001449 per ° C.

LESSON 7

Reaction of Gases to Temperature Changes

In gases the expansion due to a rise in temperature is so large that it is customary to neglect the effect of the containing vessel. This will be appreciated if one considers the order of the expansion: air has a coefficient of expansion ("cubical" is implied as this is the only possible case for gases) of 0 00366, and if one takes away the cubical expansion of the glass vessel, i.e. 0 0000051, it is only a matter of 5 in 3,600, or approximately 0 1 per cent.

There is a more serious complication. It was shown that the volume of a gas changes with pressure, so that a change in volume which takes place on heating will be related to the possible pressure conditions as well as temperature.

It is customary to deal with rises in temperature of a gas under two headings:

(1) At constant volume,
(2) At constant pressure.

In the first, the result of a temperature rise is an increase in pressure; in the second, in volume.

Taking the first case, consider the volume of the gas as constrained to be constant, when common experience leads one to anticipate that there will be a rise in the pressure. In an experiment it is possible to measure the pressure of a fixed volume of gas under different conditions of temperature and so find the relation between pressure and temperature "at constant volume."

Pressure-Temperature Relation

The graphical method shows the results of experiment to the best advantage, as in Fig. 13. The relation may be expressed as a straight line. Actually, if:

P_0 be the pressure at 0° C
P_t be the pressure at t° C,
the relation between these is

$$P_t = P_0(1 + \beta t),$$

where β is a constant which is equal to

$$\frac{P_t - P_0}{P_0 t}$$

In such instances, therefore, β is called the *coefficient of increase of pressure at constant volume*. Experiment shows that this is a constant, having a value of about $\frac{1}{273}$ (0 00366). Examination of the curve shows that it would intersect the axis of temperature at −273° C. approximately. This is also seen considering the equation. For example—

when $t = -10$° C., $P_t = P_0(1 - \frac{10}{273})$,
and when $t = -273$, $P_t = P_0(1 - \frac{273}{273}) = 0$.

The temperature of −273° C. seems to be one at which gases, *if they remained gases*, would have no pressure. More of this is considered later; but before leaving this "pressure-temperature" relation there is a point which will be apparent. If a volume of gas is enclosed and its volume maintained constant, the pressure-temperature curve can be used to measure unknown temperatures. This is the principle underlying the *constant volume gas thermometer*.

The pressure at melting ice temperature and the pressure at boiling water temperature (boiling at a pressure of 76 cms. of mercury) are taken as the "fixed points." The size of the degree is of this "fundamental interval," and is very rarely the same as the ordinary Centigrade mercury thermometer unit.

If the bulb which contains the gas is placed in an unknown temperature enclosure, and the

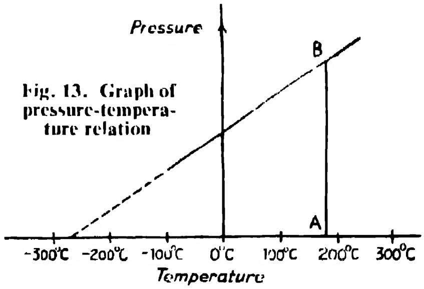


Fig. 13. Graph of pressure-temperature relation

pressure to maintain the volume constant corresponds to, say, AB (Fig. 13), the temperature can be read off the curve to be about 185° C. This type of constant volume thermometer has been used in the past to measure high temperatures.

Constant Pressure

The second method of studying the effect of temperature on gases is to maintain them at constant pressure and examine the change which takes place in the volume of the gas. Experiment shows that the volume at constant pressure is related to the temperature in a way similar to the pressure variation at constant volume. In fact, if volume is plotted against temperature a curve identical with that of Fig. 13 is produced. The equation which shows the volume-temperature relation is:

$$V_t = V_0(1 + \alpha t)$$

where V_t is the volume at t° C. and V_0 is the volume at 0° C.

Further, the value of α is found by experiment to be $\frac{1}{273}$ very nearly, so that it would appear that if a gas remained as a gas as the temperature was lowered it would have no volume at all at −273° C. This temperature is therefore called the absolute zero; and a scale of temperature, called the *absolute scale* (A°), or

Kelvin scale (K°) is used. This has its zero at −273° C., and the size of degree is the same as on the Centigrade gas scale.

Thus 0° C. is 273° A. (absolute); again, 100° C. = 273 + 100 = 373° A.; $t°$ C. = $(273 + t)°$ A., and may be written T°. (It is customary to use capital letters to indicate absolute temperatures, i.e., temperatures on the absolute scale). Considering only the constant pressure changes:

$$V_t = V_0\left(1 + \frac{1}{273}t\right)$$

$$= V_0\left(\frac{273 + t}{273}\right) = V_0\frac{T}{T_0}$$

where T = 273 + t and is the equivalent of $t°$ C. on the absolute scale; T_0 is the equivalent of 0° C. on the absolute scale.

This is often written:

$$\frac{V_t}{T} = \frac{V_0}{T_0}, \text{ or } \frac{V}{T} \text{ is a constant,}$$

which is another way of saying that V is proportional to the absolute temperature.

This is called *Charles's Law*, and it is also discussed in the Course on Chemistry, as it is always used when dealing with the volume changes with temperature. It must be remembered that at low temperatures gases are liable to change to liquids, and that the foregoing relations do not apply when a change of state of this kind takes place.

Liquids and Vapours

When water boils it changes to steam, a gaseous form of water. Even at ordinary room temperatures water evaporates and forms a vapour, as is known from the fact that water in an open vessel gradually disappears. If a closed space is taken and into it a small drop of water is introduced we have a vapour which is *unsaturated*. This obeys Boyle's Law and Charles's Law. If more and more water is introduced a state is finally reached when the water does not evaporate into the *closed* space any farther. It is said then that the space is saturated with water vapour.

This was discussed in terms of the molecular theory in Lesson 5, and it was shown that the unsaturated vapour is due to quickly moving molecules leaving the water. In the saturated state the molecules still leave the water, but as the closed space has as many molecules in it as it can contain at that temperature there are as many returning to the liquid as leave it in a given time.

Both saturated and unsaturated vapours exert a pressure, as may be shown by using the space above the mercury in a barometer tube as the "closed space" referred to. This is the Torricellian vacuum, discovered by the Italian scientist Evangelista Torricelli (1608–47) in 1643. If water is introduced, drop by drop, in the vacuum above the mercury, it is found that the mercury is depressed owing to the pressure of the water vapour.

When sufficient water has been introduced to saturate the space, as judged by the fact that a little water remains *as such* on the mercury surface, it is found that the water vapour—called the *saturated* water vapour—exerts a maximum pressure at the temperature of the experiment.

This is called the saturated vapour pressure. It can be measured in the way indicated in Fig. 14, where the left-hand barometer is an ordinary one and the right-hand tube contains free water over the mercury. The length h is the saturated water vapour pressure in cms. of mercury at the temperature of the experiment.

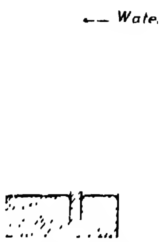


Fig. 14. Saturated water vapour in a barometer.

If the temperature rises the saturated vapour pressure gets bigger and, finally, for water, when the temperature is raised to 100° C. and the barometer reads 76 cms. the water boils and the mercury in the tube is forced down to the level of the mercury outside. The saturated vapour pressure becomes equal to the outside pressure. If the barometer is low it is not necessary to heat the tube to 100° C. to bring this about. That is to say, the water boils at a lower temperature than 100° C.

Take, for example, water boiling up a high mountain where the atmospheric pressure is always much less than 76 cms. of mercury; the boiling point of water is correspondingly low—it might be as low as 94° C. If the pressure is increased the boiling point is raised. This is accomplished in boilers, domestic pressure cookers, and the like, where the steam is not allowed to escape until the pressure is high enough to open a valve at a set pressure. The temperature can in this way be raised to quite high values due to the steam pressure.

It will be seen now why it was found necessary to stipulate the atmospheric pressure when considering the upper fixed points of a thermometer, as water boils at 100° C. only when the pressure is 76 cms. of mercury.

Liquefaction of Gases

All the gases so far regarded in a general way as being the natural state of the element concerned, e.g. oxygen, nitrogen, etc., can be considered simply as unsaturated vapours of the corresponding liquid state. The so-called "permanent gases" are no exception to this rule. They can, by proper means, be converted to saturated vapours and liquefied.

Some gases respond to the same treatment as saturated vapour of water—simply by cooling them. Others can be liquefied by pressure only (e.g. sulphur dioxide), but in the latter case the gas must be below a temperature which is critical to the gas itself. At ordinary room temperatures, for example, sulphur dioxide may be liquefied by pressure only because it is below its *critical temperature*.

Many early attempts at liquefaction of gases were carried out without success, despite the use of really large pressures, for the critical temperatures of the gases concerned were below the temperature of the room.

It is realized nowadays that no pressure, however great, can bring about liquefaction unless the gas is first cooled below its critical temperature. The simple method of producing a small amount of cooling is to use a freezing mixture. Ordinary salt, calcium sulphate, etc., when mixed with ice reduce the temperature below zero, but not *very* much below. This temperature (15° to 16° below zero) can be used to liquefy certain easily liquefied gases, and the liquids so formed may be used to produce cooling in other gases, and so on.

Expansion of Compressed Gas

To produce a really appreciable drop in temperature the method which has been most used is the expansion of compressed gas. If a gas is compressed a rise in temperature is produced; all who have pumped up a bicycle tyre will have experienced this effect. Conversely, if the compressed gas is allowed to expand suddenly it cools.

So if a gas—say, air—is compressed and it is cooled as low as possible by surrounding it with a low-temperature bath (freezing mixture, liquefied carbon dioxide, etc.), and then it is allowed to expand, it will cool still further. This process is used to liquefy oxygen, nitrogen, the mixture air, and is discussed in the Course CHEMISTRY.

With liquid helium physical investigations can be made at the extremely low temperature of this liquid (−269° C.) sufficiently low, in fact, to be approaching the absolute zero (it is actually about 4° A.).

At these very low temperatures matter takes on very interesting properties. Electric resistance, for example, becomes exceedingly small, and the metals become "super conductors"—a well-earned title. If a ring of metal at the temperature of liquid helium has an electric current induced in it the current goes on flowing for days.

Liquid air when placed on ice behaves in the same way as would water placed on a dull red-hot metal. Sir James Dewar (1842–1923), who first produced liquid air, was faced with the problem of how to store the liquid; he solved the problem by making the Dewar flask, also called the vacuum flask (Fig. 15). For the moment it can be assumed that the liquid can be stored, while brief consideration is given to what properties ordinary matter has when at the temperature of liquid air.

Most substances change their elastic properties. For example, a bell made of lead is useless at ordinary temperatures but it will ring with a good clear note when cooled down in liquid air. At this temperature a lead spiral acts like a spring and will support a weight; flowers become brittle and can be powdered into fine dust; grapes, meat, india-rubber, etc., all become brittle and can be smashed into a thousand pieces if hit by a hammer when at this temperature.

Even mercury becomes a hard solid; frozen solid in liquid air, it can be moulded into the form of a hammer, substantial enough to drive nails into wood. If these things happen at such a temperature as −183° C. one can "expect the unexpected" at —269 C., the temperature of liquid helium.

LESSON 8

The Three Methods of Heat Conveyance

In the previous Lesson the production of very low temperatures and the liquefaction of so-called permanent gases were considered. It was found that when air was liquefied there was a great difficulty in storing it, as it so rapidly boiled away at ordinary temperatures.

The vacuum ("Thermos") flask, which Dewar invented to overcome this difficulty, attains its object because in the design steps were taken to eliminate all gain of heat from the outside by the liquid kept within it. Thus a cold liquid placed in the flask remains cold, a hot one remains hot.

What Dewar really made in this flask is a good thermal insulator, i.e. he was able to cut down to a minimum all heat transference to or from the inside of the flask. To understand how this is brought about one must be acquainted, as he was, with the methods by which heat can pass from one place to another, and so see how to prevent its passage. Three general methods by which heat is conveyed from point to point are recognized; these are known as the methods of *conduction*, *convection*, and *radiation*.

In conduction the random agitation ($\frac{1}{2}mv^2$) of the molecules of the substance conveying the heat passes from molecule to molecule through the mass of the substance; in consequence the temperature rises along the length of the

conductor If a poker is left in a fire the end remote from the fire eventually becomes hot, but the intermediate parts are hotter, i.e. there is a gradual drop in temperature along the length of the poker. In fact, the thermal agitation passes from molecule to molecule and so the temperature rise spreads.

Thermal Conductivity

Substances behave differently in this respect There are good conductors of heat (e.g. silver, copper, and the metals generally) and bad conductors of heat (paper, wood, etc.). As an example of a bad conductor perhaps the most obvious is an ordinary match which when burning can be held until the flame is almost at the fingers ; no discomfort is felt, because the wood is a bad conductor of heat.

Asbestos packing is placed round hot-water pipes and hot-water storage tanks because it is such a poor conductor of heat. Glass is another bad conductor. Some silver teapots are highly decorative but when provided with silver handles these are extremely unpleasant to hold, because silver is one of the best conductors of heat and so the handle becomes very hot.

On a cold day one finds common examples in the difference of *thermal conductivity* of different substances If one touches a metal object it seems very cold, as heat is conducted from the hand by the metal ; whereas if one touches a wooden object, which one knows is at the same temperature, it feels much warmer, because heat is not conducted away by the wood.

Convection

Liquids, generally speaking, are very poor conductors of heat. If a piece of weighted ice is placed in a test-tube of water, the water in the top of the tube can be vigorously boiled without melting the ice in the bottom. In this experiment it will be noticed that the heat is applied to the *top* of the liquid and any thermal conductivity is downward. This is done deliberately because the temperature of the water when heated from below is raised by another process called *convection* This is the method whereby liquids and gases are most often heated.

The lower layers when in contact with the supply of heat naturally become hotter , they expand, and so, becoming less dense than the rest of the fluid, they rise within it and carry the hot portions bodily through the rest. To take the place of the hot fluid, cooler fluid sinks and in turn becomes heated, until the whole mass acquires a higher temperature.

In convection it is seen that there is this bodily movement of the heated fluid. It is not a case of passing on the temperature rise from molecule to molecule, but a movement of the agitated molecules yielding place for the slower moving ones to come in contact with the heat source.

This process of convection on a large scale is the cause of land and sea breezes. In summer, when the sun shines on land and sea, the land, of low specific heat, becomes hotter than the sea. The air in contact with the land rises and colder air from over the sea comes in, as a sea breeze, to take its place.

At night, when there is cooling, the land cools more quickly than the sea ; the reverse process takes place and causes a land breeze If the circulation of the air is stopped this method of heat transference is eliminated. As an example, notice how much sooner a pan of water boils when the lid is on than when the pan remains open and allows a continuous convection of the heat from the surface of the water.

Radiation

Both the methods of heat transference so far considered depend on the presence of some form of material substance. If the hot body could be supported by a fine thread of a very bad conducting material and be placed in a vacuum the heat-loss by these two methods could be virtually eliminated, yet it would be found that the temperature of the body would fall

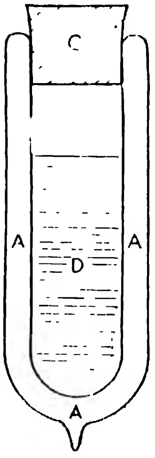


Fig. 15. VACUUM FLASK. A, vacuum; B, seal; C, cork; D, liquid.

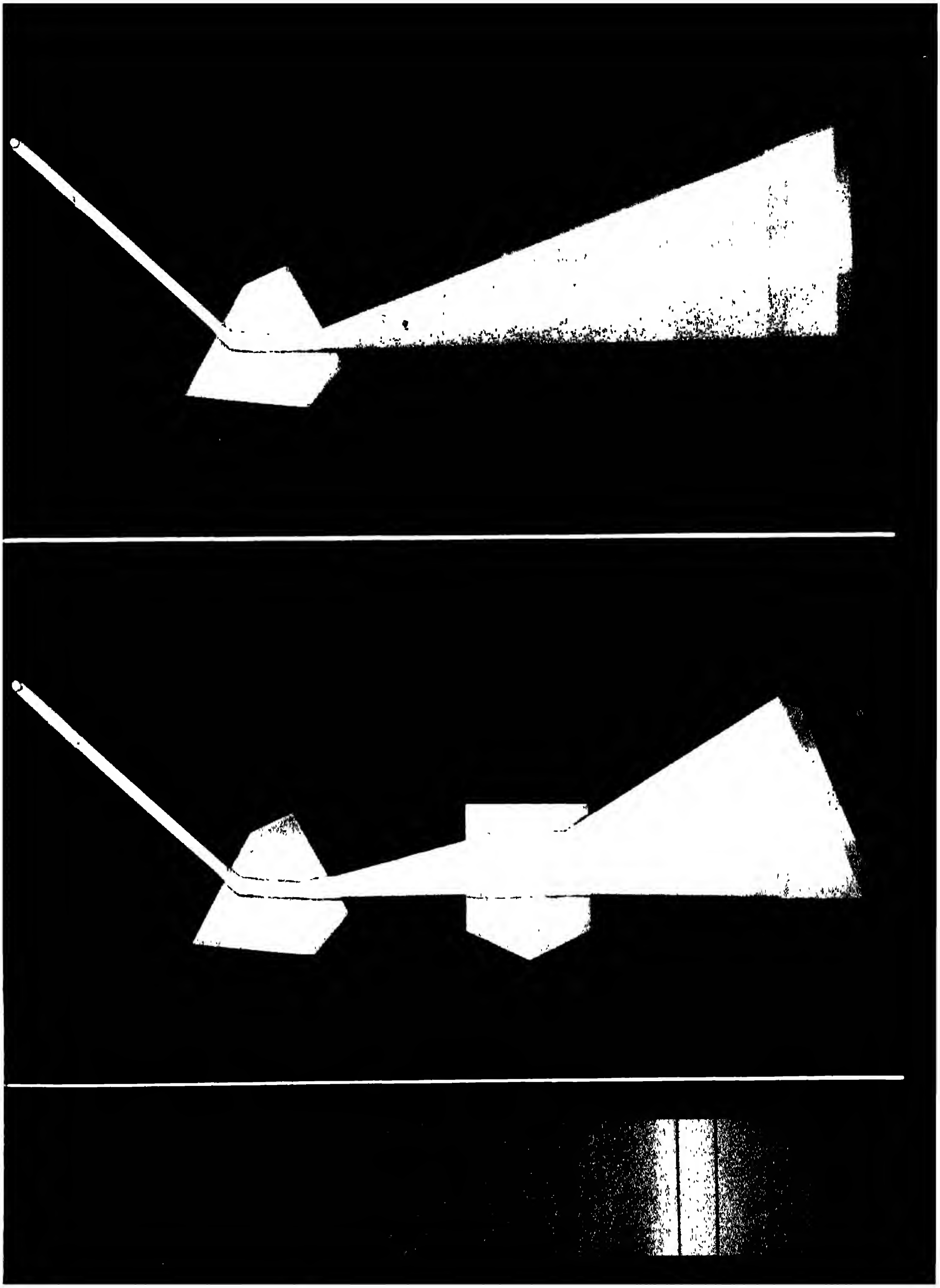
The reason is that it loses heat by the process of radiation. It would appear from the foregoing that heat in the form of radiation may be transmitted without the help of any material medium ; this is so, and it is the important distinguishing feature of the process.

Perhaps the best example of radiation is the passage of heat from the sun to the earth. The amount of heat received is appreciably diminished when a cloud intercepts the sun's rays During an eclipse of the sun it is most noticeable that the instant the light is cut off there is a pronounced drop in temperature. This suggests that the heat from the sun comes to the earth at the same speed as the light, and that it does so in a straight-line path.

On a small scale, ample evidence of the fact that heat travelling in the form of radiation does so in straight lines is provided by an open fire. The moment a solid object is placed between the fire and ourselves all radiation is cut off from us.

Refraction

A simple experiment can be performed to show that heat which is radiated obeys other laws which are followed by light. A lens is used to focus the sun on to a piece of dry tissue paper or dry leaves ; after a little time the dry



LIGHT passing through crystals ; bottom, Fraunhofer lines. Reverse : full spectrum, and colour mixtures.

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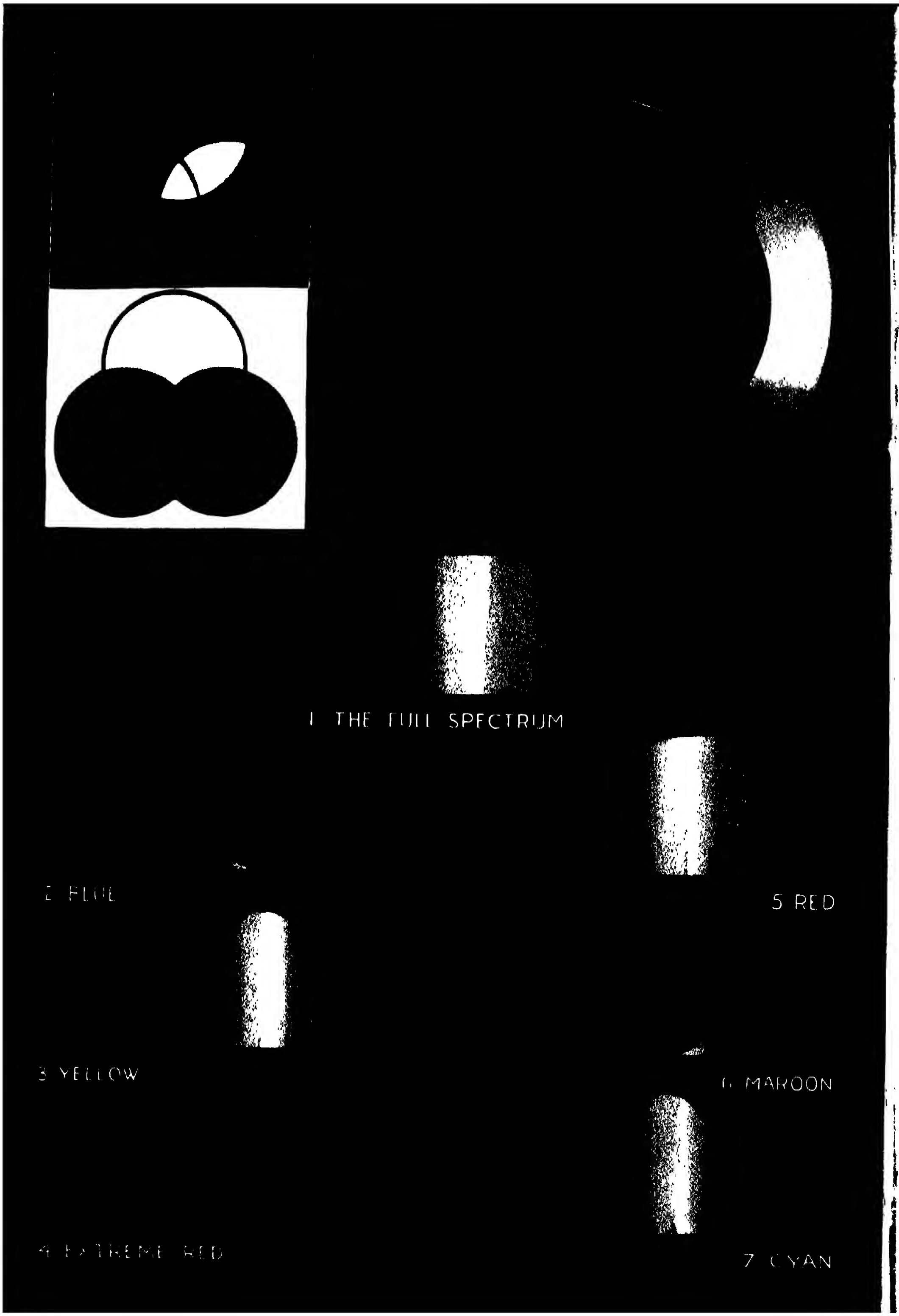
PHYSICS, LESSONS 10, 11, and 12


1 THE FULL SPECTRUM
2 BLUE
3 YELLOW
4 EXTREME RED
5 RED
6 MAROON
7 CYAN

object begins to smoulder and finally it takes fire. This shows that the light and the heat are equally bent by the lens; the *refraction* of the two is the same

Vacuum Flask

An important consideration in the loss of heat by radiation is the nature of the surface of the hot body. If the surface is black and matt in character the loss of heat by radiation in a given time is great compared with the loss from a similar body with a brightly polished surface. If you take two copper balls of the same size and at the same temperature, polishing one brightly and depositing soot on the other, and then hang them in front of a fire by a thin thread, it will be found that the black one absorbs more heat and is therefore hotter after a given time. By a general law good absorbers are good radiators, and good reflectors are bad radiators and bad absorbers, hence white clothes in the tropics.

The three processes can be summarised by considering the example of the vacuum flask, a section of which is shown in Fig 15. It consists of a double-walled vessel of thin glass which is a bad conductor of heat. The air between the walls is pumped out and the tube is sealed. The "vacuum" has no appreciable gas left in it, and so convection is stopped.

The inner faces of the walls of the flask are silvered, and so if the liquid is hot it is in a bad radiator. Any heat which is radiated is reflected back by the outer walls, and so radiation is practically eliminated. It is most important to have a cork to stop convection above the liquid. The minute amount of heat conducted along the glass walls is the only loss. This flask embodies all the necessary steps to eliminate heat transference, so that the liquid therein remains at a constant temperature for considerable periods.

LESSON 9

Some Properties of Wave Motion

The heat from the sun reaches the earth in the form of waves. These waves are like light waves and they follow the same laws. In physics one often meets with examples of energy being transmitted in a wave form, and it is desirable at the outset to have a clear idea of what is implied in the term wave motion, how it travels, and the like.

The first reference to waves no doubt brings to mind a picture of waves on the sea, where there is a very direct visual evidence of the up-and-down movement of the water and the bodily movement of the form which is called wave. One thing which this example shows clearly is that in the wave motion any part of the water through which the wave travels is not moving with the wave. For example, if you watch a boat on the sea it moves up and down as the wave passes it, but it does not move bodily with the wave.

Simple Harmonic Motion

The simplest form of wave transmission (Fig. 16) can be demonstrated by tapping a stretched string; the tapping produces a depression in the string which travels as a wave until it reaches the other end, where it is reflected back again. The tapped part of the string comes back to the original position in time; i.e. the string, like the water waves, moves up and down. The depressed part does not go along the length of the string, although the wave motion does so. If instead of tapping the string one end is moved up and down the wave continues to travel along the length of the string.

The same effect is seen with a skipping-rope: when one end of the rope is moved up and down, the next piece is caused to move in a similar manner; the movement, if maintained at the first end, continues the length of the rope. The beginning of the wave, therefore, is the up-and-down movement of the "medium" in which the wave is transmitted.

The best-known movement of this type is called *simple harmonic motion*. The bob of a pendulum is a good example of this. The physicist's simplest illustration of the production of simple harmonic motion (S.H.M.) seems rather arbitrary, but is nevertheless worth considering as it does give help in considering waves.

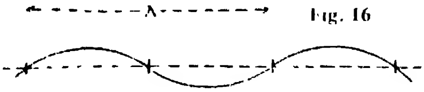


Fig. 16

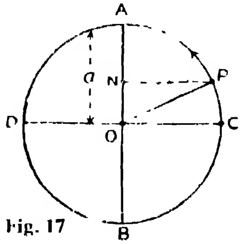


Fig. 17

WAVE MOTION. Fig. 16. Simplest form of wave transmission. Fig. 17. Illustrating what is termed simple harmonic motion; an explanation of the lettering is given in the text.

Consider a point, P, to move round a circle with a constant speed (*see* Fig 17). It will go from A to D, D to B, B to C, and C to A, in equal times. Now imagine that from P, at every point it occupies, a perpendicular PN is drawn on to the diameter AB. Then it is clear

that as P moves round the circle, the foot of the perpendicular, N, moves up and down the diameter.

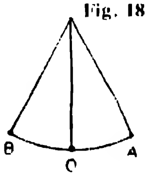
If we start with P at A and let it go round the circle once, N will start at A and go down to B, and, in fact, will be at point B when P is there: and as P goes along BC, N will move along BO and finally come back to A when P reaches this point. N will complete one "there and back" movement whilst P makes one complete circuit.

The time for this will be fixed, of course, if the speed of the point P is known; this time is called the *periodic time*, T, and it is also the time for one complete "there and back" movement of N. N is said to oscillate with simple harmonic motion.

This simple harmonic motion has an extreme *amplitude* OA or OB = a, say. The time taken for the point N to go from the position of rest O to A is T/4: after a second T/4 the point N is back again at O: then, in a further T/4, it is at the other extreme at B, and so on.

Considering the example of S.H.M. as provided in the simple pendulum, it is seen in Fig. 18 that OA = OB is the amplitude, and the time taken whilst the bob goes from O to A, back through O to B, and finally to O again, is the periodic time T, which, incidentally, is equal to $2\pi\sqrt{l/g}$ (as stated in Lesson 6). The point to be noticed is that the bob passes through O twice, once in each direction, and T is the time taken from one transit to the next *in the same direction*. It is convenient to start timing the bob as it passes through O.

Fig. 18



Simple Harmonic Motion.

Consider the motion in a little more detail. Starting with the position o for P, the foot of the perpendicular N is at O, in Fig. 19. The circumference is divided into 12 equal parts; therefore the time taken for P to go from one of these points to the next is T/12. When P is at 1, N is at A; when P is at 2, N is at B, and so on. When P is at 3, N is at C (the same point), and is for the moment at rest whilst the direction of movement changes. At O, on the other hand, the velocity of N is greatest.

Difference of Phase

Now consider a row of particles, S, T, U, V, W, X, etc., all oscillating with simple harmonic motion of the same amplitude a and periodic time T. Let the left-hand part of the diagram (Fig. 19) be the key to give the positions of all the particles.

If all start at rest and move upwards they will all bodily advance to the first, then second, and then third dotted line position, and so on. If they do not start together but the particles are so arranged that each has a start of T/12 over its right-hand neighbour, we obtain the result we are requiring.

For example, S moves to position 1, and so gets T/12 start: when S moves to position 2, T moves to position 1: when S moves to position 3, i.e. $3\frac{T}{12} = \frac{T}{4}$, T moves to position 2 and U moves to position 1: S now moves back to position 2, T moves to position 3, U moves to position 2 and V moves to position 1. Finally, when S gets back to its original position at S the other particles are in the positions shown in the wave line of Fig. 19.

Draw a row of 12 equally spaced dots instead of S, T, etc., and carry on with this, moving each in distances as given by the key diagram, and it will be found that the result is a wave which moves from left to right, although each particle is only made to move up and down with S.H.M., differing in starting time by T/12. There is a difference of *phase* between the motion of the particle S, T, U, V, etc., of an amount corresponding to T/12. The phase difference is usually represented by the angle which the tracing point has gone in the time:

i.e. 360 (angle gone in time T) ÷ 12 = $\frac{360}{12}$ phase difference.

The important part of all this is the conclusive evidence that a wave motion is produced by a row of particles vibrating with S.H.M., when equal phase differences exist between adjacent particles. In the case represented by the illustration, the particles are vibrating in one direction and the wave is transmitted in a direction at right angles.

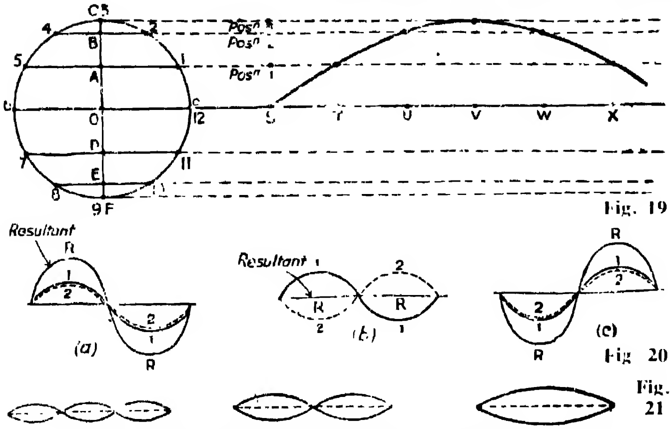
Transverse Waves

This kind of wave is called a *transverse wave*. There are many examples of this type in addition to the obvious ones considered (waves on a stretched string, water waves, etc.). There are the less obvious light waves, wireless waves, radiant heat waves, etc.

If the particles S, T, U, V, etc., were made to vibrate in a direction parallel to SX, i.e. at right angles to the direction taken in Fig. 19, waves of a different character, called *longitudinal waves*, would be produced. The best example of this type of wave is the ordinary sound wave, which will be studied later. Transverse waves are easier to visualise and easier to illustrate by diagram, so this Lesson continues with wave properties of this type.

Stationary Waves

Returning to the example of the long skipping-rope, fastened at one end and shaken at the other; for one sharp jerk the pulse or wave set up may be sent back or reflected from the fixed end. If the tension on the rope (i.e. pull on the



WAVE MOTION. Fig. 19. Detailed diagram illustrating simple harmonic motion. Figs. 20 and 21. Showing production of interference of waves.

rope) is increased and the end is moved up and down with sufficient speed it is found that the waves which are being sent along it and the waves which come back begin to act on each other, and in time, with suitable oscillation of the free end, the rope seems to take up a stationary form of one, two, or more loops, and there is no longer a wave *progressing* along the rope. This is called a *stationary wave*.

It is brought about by the interaction of the two wave trains—the incident and the reflected. This interaction is to be expected. Suppose that the two sets of waves are so arranged that the crest and troughs of each fit together: the effect will be a double amplitude. If the crest of one comes with the trough of the other, the two waves just neutralise and there is no motion at all.

This is indicated in Fig. 20, which shows (*a*) two waves fitting crest to crest and trough to trough, and R shows the resultant with double amplitude. Fig. 20 (*b*) shows waves 1 and 2 with crest to trough, and R is the resultant. This shows that if two waves are sent in the same direction with equal amplitude, but with 180° phase difference (*b*), the result is just as if no waves were present. If the waves go in opposite directions they are first as in Fig. 20 (*a*), then as in (*b*), then as in (*c*), then (*b*) and then (*a*), etc., i.e. they form stationary waves which are illustrated in Fig. 21.

Another way in which waves can react and reproduce what is called interference is illustrated if a flat dish is filled with water. Two identical tuning forks have each a small bristle attached, so that when the forks vibrate the bristles set up little waves on the water surface. Photographs of these waves can then be analysed.

If only one fork vibrates there is set up a series of concentric water waves. When the other fork vibrates the waves it sets up interfere with the first set, and lines marking positions of no movement of the water can be seen. In fact, if at any place one wave causes a crest and the other a trough there is no *net* movement, provided the amplitudes are the same.

When a wave approaches an obstacle it may behave in one of two ways; either it will be stopped or reflected, or if the obstacle is a small one the wave can bend round it. If a sea is running towards a long breakwater, it is noticed that near the end of the breakwater wall there is a slight movement, but within the "shadow" of the wall there is no appreciable movement. If one watches a little farther from the shore the same sea approaching a large rock there is no appreciable shadow; the waves appear to bend round the obstacle. All these properties of waves will be expected in any wave motion. If light, "waveless" waves, etc., are true waves they must show these properties.

LESSON 10

Light and the Laws of Reflection and Refraction

LIGHT travels in a straight path. If an opaque object is placed between a very small bright light source and a white screen in a room where no other light enters, a shadow is formed on the screen which has a shape identical with that of the object casting the shadow. This is consistent with a straight line path for the light, or with "rectilinear propagation" of light, as it is called. If a large source of light is used this sharp outline is not seen. There appears to be a double edge to the shadow, which has a black centre of the shape of the object, and this is edged with a half shadow, of the same outline. This is again consistent with rectilinear propagation of light.

In Fig. 22 let AB be a large source of light illuminating a screen and let the object be a ball. If light travels in straight lines from every point in the source, from A the light will go to the screen and the rays AP and AQ will just skim the object. On the screen there is no light between P and Q from A, and PQ would be the diameter of the black shadow if A was the only illumination.

Figs. 22 and 23. Experiments to show that light travels in straight lines.

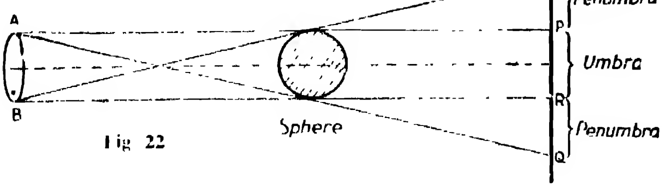


Fig. 22

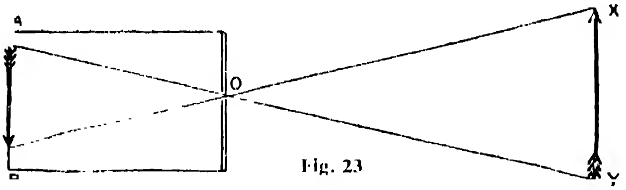


Fig. 23

Going to the other extreme of the source, it is equally clear that SR is the shadow cast by the sphere with regard to the light from B. The region PR is in the shadow from both ends and also for all the points in the source. All points on the screen above S receive light from all the sources; from S to P the screen is illuminated by a less and less fraction of AB, and finally at P it does not receive any light at all.

The same happens in the under half of the shadow. There is a circular black shadow (umbra) (PR) at the centre of a circular partially black shadow (penumbra). On a large scale, if AB is the sun and the object casting the shadow is the moon, the resulting eclipse of the sun as seen from the earth is total if the earth happens to be within the region PR, partial if in the region SP or RQ. The experiments referred to are only to show that the light does travel in a straight line.

Angle of Incidence

A simple experiment to add support to this contention that light travels in a straight line is conducted with a pin-hole camera (Fig. 23). A pin-hole O is made in the centre of one end of a light-tight box, of which the other end AB is of ground glass. When the box is pointed at a brightly illuminated object, represented in the diagram by the arrow XY, an inverted image of the object is produced on the glass screen. The straight lines show the path of the light rays which produce the image.

When light falls on a mirror it is reflected, and the directions before and after reflection are simply related. The straight lines in the diagram are called rays. A bundle of rays together is called a beam of light. For the simple treatment, consider rays only. If a ray of light falls on a mirror (Fig. 24) it is reflected in a direction which depends on the angle at which the incoming light strikes the mirror. The incoming ray is the incident ray, the outgoing ray the reflected ray.

Imagine a line drawn at right angles to the mirror at the point of incidence; this line is called the normal at the point of incidence. The angle between the incident ray and the normal is called the *angle of incidence*: the angle between the normal and the reflected ray is called the *angle of reflection*.

It is easy to demonstrate the truth of the two Laws of Reflection:

(1) The incident ray, the normal at the point of incidence, and the reflected ray are all in one plane;

(2) The angle of incidence is equal to the angle of reflection.

These laws are actually a statement of the results of many experiments. For example, if in a train at night-time, when the windows act as mirrors, you are at position A in Fig. 25, which represents the plan of your carriage, and at X there is someone you think you know, but you hesitate to observe him too closely, the obvious thing to do is to apply the Laws of Reflection.

If you look out of the window so that the normal at the point of incidence is in a plane containing A and X, and the direction at which

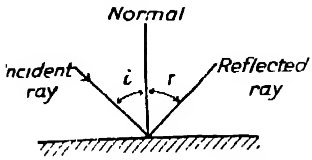


Fig. 24

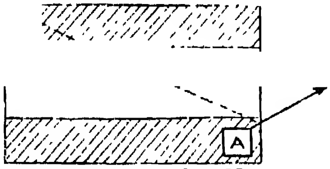


Fig. 25

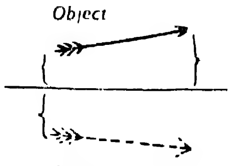


Fig. 26

Figs. 24, 25 and 26. Illustrating the Laws of Reflection.

you appear to be examining the outer darkness is shown by the arrow, you are actually choosing a direction such that the dotted line and your direction are equally inclined to the window, and you see the person at X apparently outside the window and you can do your observing. The fact that plain glass can be made to act as a mirror is used by illusionists in the production of stage "ghosts" and other tricks.

In all instances of reflection in plane mirrors

the object looked at is reproduced as an image in the mirror. This image does not exist, but the eye takes in a beam of light that appears to diverge from an image as far behind the mirror as the object is in front of it. This type of image is called a *virtual* image, and in a plane mirror it is the same size as the object. With a large object it produces a virtual image in a plane mirror (Fig. 26).

Concave and Convex Mirrors

If curved mirrors are used other results are obtained. For example, if glasses which are parts of spheres are silvered the result is either concave mirrors (the inside of the spherical surface reflects), e.g. shaving mirrors; or convex mirrors (the outside silvered and reflecting), e.g. motor-car reflector mirrors. In these instances the image is not always virtual and is not, in general, as far behind the mirror as the object is in front.

The position of the image produced in either type of spherical mirror is found by applying the Laws of Reflection to the rays which leave the object. For example, in Fig. 27 the centre of

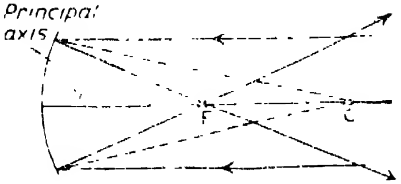


Fig. 27. Reflection from spherical mirror

the sphere of which the mirror is a part is at C and is called the centre of curvature. When a parallel set of rays falls on the mirror — say from the sun — the normal (in each case) to the mirror is the radius, i.e. the line joining the point of incidence to C, and each ray is reflected at an equal angle on the other side of the normal.

Dealing with small mirrors, the reflected rays all pass through F, which is called the principal focus and is nearly half-way from C to the mirror. If you reverse the rays you can see that all the rays passing through F, on their way to the mirror, after reflection go out parallel to each other and to the principal axis.

If C is the centre of curvature and F the principal focus, an object placed at O, as in Fig. 28, will produce at I an image which is inverted and smaller than the image. The position of I is obtained by drawing a ray, parallel to the principal axis, to A; after reflection it goes through F. A second ray incident through F after reflection comes out parallel to the principal axis and intersects the first ray at I, causing the brightness which is associated with the image.

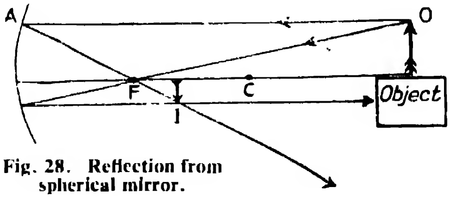
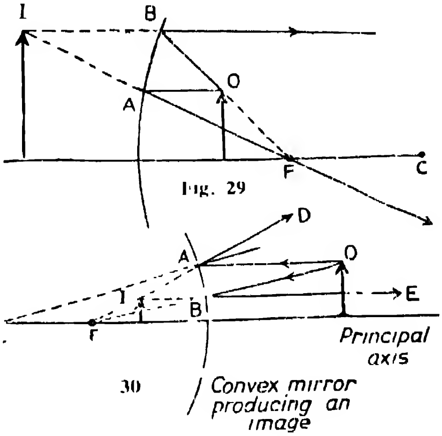


Fig. 28. Reflection from spherical mirror.

If a screen were placed at I an image would be formed different from the virtual images formed by plane mirrors. This is called a *real* image because the rays of light do actually pass through it. If an object were placed at I its image would be at O: it would be inverted and real.

If the object is placed nearer to this type of mirror than the principal focus the image produced is no longer upside down or real. It becomes virtual, and of a size greater than the object depending on the distance from the mirror to the object. In Fig. 29 an object is placed at O: the two rays are drawn and obvi-



VIRTUAL IMAGES. Figs. 29 and 30. As reflected from concave and convex mirrors.

ously appear to diverge from I, which is therefore the virtual image of O. It is noticed that the image is bigger than the object. The concave mirror used as a shaving mirror acts in this manner.

The convex mirror always produces virtual images of smaller size than the object and therefore allows a much larger field of view to be appreciated at once. Hence the use of convex mirrors as reflectors in motor-cars. When light falls on this type of mirror parallel to the principal axis it reflects away and appears to come from the principal focus (e.g. in Fig. 30 OA incident reflects to AD).

Here, again, a ray directed to F reflects away parallel to the axis. (OB, directed on F, reflects along BE.) Both rays appear to come from I, which is the diminished virtual image of O. The farther away the object is from the mirror the nearer to F is the image. So in a car reflector

mirror a car approaching from behind gradually appears bigger as its image moves from near F to the mirror itself.

In mirrors of both kinds one is able to calculate the position of the image if one knows where the object is and also the focal length of the mirror (i.e. the distance from F to the mirror). There is not space to discuss this in detail, but it may be taken that if the image distance is v, and the object distance u, and the focal length f, then :

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

provided that distances on the object side of the mirror are called positive and those on the other side negative.

Thus, with a concave mirror of focal length 15 cm. and an object 40 cm. away, the image is produced a distance v away, such that :

$$\frac{1}{15} = \frac{1}{40} + \frac{1}{v} \text{ or } \frac{1}{v} = \frac{1}{15} - \frac{1}{40} = \frac{8-3}{120} = \frac{5}{120}$$

$$\text{or } v = \frac{120}{5} = 24 \text{ cm.}$$

(i.e. on the same side as the object and therefore *real*).

For the same mirror an object 10 cm. away has an image v' away, which is given as before :

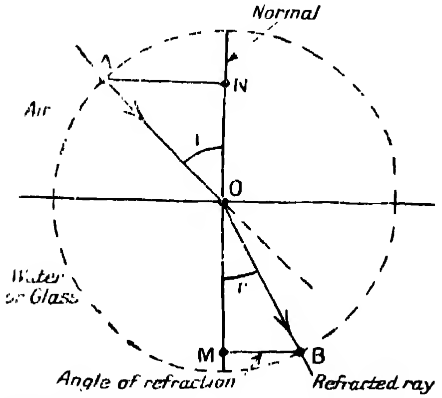
$$\frac{1}{15} = \frac{1}{10} + \frac{1}{v'} \text{ or } \frac{1}{v'} = \frac{1}{15} - \frac{1}{10} = \frac{2-3}{30} = \frac{-1}{30}$$

$$\text{or } v' = -30,$$

this means 30 cm. on the other side, and therefore the image is *virtual*.

Refracted Light

Mirrors give good reflection because of the opaque silvering which backs them. But there is no real need to have an opaque surface to get reflection, although a stronger reflection is obtained from such surfaces.



REFRACTIVE INDEX. Fig. 31. When light passes from air to a more dense medium such as water or glass, the refracted ray bends towards normal, making r less than i.

If you look into a still lake you see the sunlit landscape reflected in it, and at the same time objects beneath the water surface are seen. If you swim under the water with your eyes open you should still be able to see the landscape which the water surface reflects. In other words, the surface reflects part of the light and transmits the rest. The rays of light which penetrate the water do so in a direction different from that of incidence : the light is *refracted*.

When an object which is under water is viewed from outside, the refraction of the rays makes the water depth appear less, and a submerged object appears nearer the surface than it really is.

Laws of Refraction

By simple experiments the path of the rays from one medium to another can be traced and the results will agree with the following Laws of Refraction.

(i) The incident ray, the normal at the point of incidence, and the refracted ray, are all in the same plane.

(ii) There is always a constant relation between the sine of the angle of incidence and the sine of the angle of refraction for a given pair of media. The ratio

$$\frac{\sin i}{\sin r} = \text{constant},$$

is called the refractive index (μ) for the pair of media.

NOTE.—The sine of an angle is a convenient way of expressing the angle itself. For example, $\sin i$ (Fig. 31) = perpendicular AN ÷ hypotenuse OA

$$\text{sine } r \text{ (written } \sin r) = \frac{BM}{OB}$$

$$\therefore \mu = \frac{AN}{OA} \div \frac{BM}{OB} = \frac{AN}{MB} \text{ and this is constant}$$

The refractive index is always greater than unity when light goes from air to a more dense medium like water or glass, i.e. the ray from air always bends towards the normal, making r less than i, as in Fig. 31. If the path of the rays is reversed the refractive index is less than unity.

It is possible now to appreciate why the object under water always appears nearer to the surface when viewed from air. Let A (Fig. 32) be such an object. The ray AN, from A at right angles to the surface, suffers no bending ; any other ray is refracted as shown in the figure.

The two rays drawn, AB and AD, are refracted along BC and DE, and an eye placed to receive them is tricked into believing that the rays have come all along in the directions BC and DE—i.e. from I, which is the point where these rays meet if produced back. I is the image, and the object A appears to the eye to be at I, which is nearer the surface than A.

In a slab of glass with parallel faces the refraction results in a ray of light being displaced, but the direction is still parallel to its original

direction. For example, if a ray AB strikes the face of such a parallel-faced glass slab (Fig. 33) it is bent towards the normal *in the glass*, as along BC, and away along CD in air, where CD is parallel to AB. A appears to be at A¹.

Emergent Beam

If the glass is in the form of a prism a different result is obtained, which leads to rather important consequences. For example, in Fig 34 is shown the path of a ray ABCD ; notice that CD emerges in an entirely new direction. If the light AB is ordinary white light another additional fact is apparent. Looking in the direction DC it is found that the beam which emerges is made up of the different colours of the rainbow

The incident white light AB becomes split up by the prism into these colours. This will be studied later ; the simple deviation of the ray in the prism as a result of refraction at two surfaces is our present interest.

If the angle of the prism, marked x in Fig. 34, is big, the deviation is big ; if x becomes small, the deviation is small, as may be seen if different diagrams are drawn and a construction is used (as in Fig. 31) to find the path of the rays.

In a lens one has the equivalent of several prisms of different angles placed on top of each other, and the result is that rays falling on it are all bent to such an extent that they intersect and are " brought to a focus "

Take the example illustrated in Fig. 35, in which a parallel beam, parallel to the principal axis, is incident on a *convex* lens. The ray along the principal axis is, virtually, striking a parallel-faced slab, and so goes through without deviation. Rays 1.1 each hit the lens at the same distance from the principal axis, and the parts of the lenses on which they fall may be regarded as prisms having an angle sufficient to make the rays pass through F. Rays 2.2 fall on the lens where the equivalent prism has a larger angle, producing so much extra deviation that the rays also pass through F. F is a *real* image, and the diagram illustrates what happens when a beam falls on the lens, producing a real image of the sun at F.

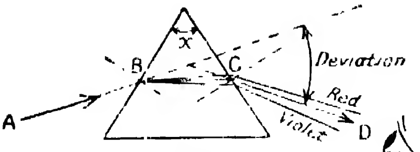


Fig. 34

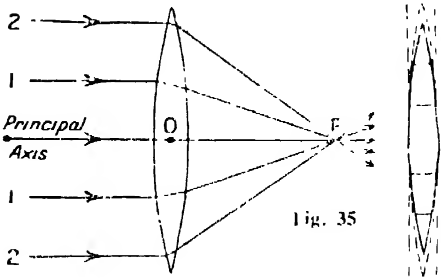


Fig. 35

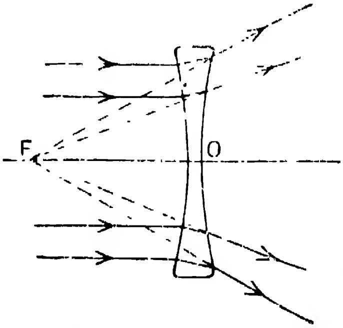


Fig. 36

PRISMATIC AND LENTICULAR REFRACTION
Figs. 34, 35, and 36 illustrate the deviation of light rays in prisms and lenses. The lettering refers to descriptive matter in the text.

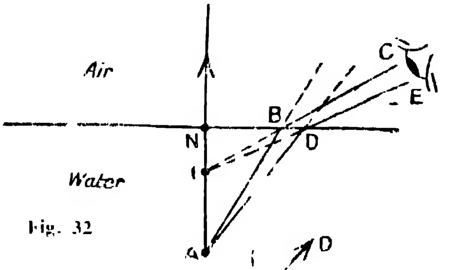


Fig. 32

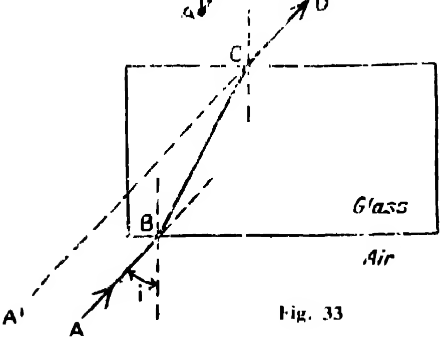


Fig. 33

EFFECTS OF REFRACTION. Fig. 32. An object under water seems to be nearer the surface than it really is. Fig. 33. Displacement of an object seen in a mirror.

Symmetrical Image

Although prism segments as shown in Fig. 35 would bring this about, a continuous surface such as that of a cylindrical lens is better ; but in order to make the image symmetrical it is more often arranged that the lenses are spherical.

The point F is called the principal focus and OF, written f, is the focal length Since the central part of the lens is really bounded by

parallel surfaces a ray of light which is directed to O passes through without deviation; it has a slight lateral movement (*see* Fig. 33), which is small if the lens is thin.

Another form of lens is called the *concave* lens, and the action of this type on a parallel beam is seen in Fig. 36. The rays appear to come from F—they do not actually do so—and therefore F is a virtual image of a distant object.

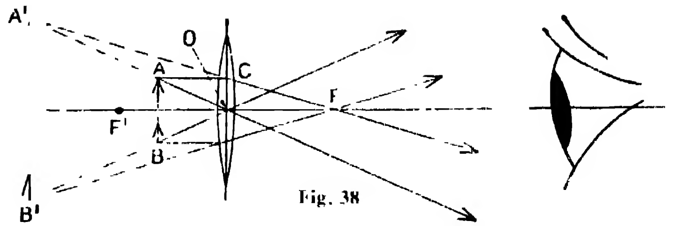


Fig. 38

Lenses are used in the camera, the projection lantern, the telescope, the microscope, etc.; and here it is desirable to consider how simple lenses produce images, what arrangement of lenses is used, and how this arrangement of lenses produces a final image.

First, the simple lens. The position of images produced may be obtained graphically if you consider rays of light starting at one point on the object and find where they intersect after passing through the lens.

If the rays do not intersect to produce a real image they will appear to come from a point which is the virtual image. Three rays are sufficient, in general, to do this construction, as illustrated in Fig. 37: (a) a ray from B parallel to the principal axis, after refraction goes through the focal point, F; (b) a ray through F^1 after refraction goes out parallel to the principal axis, and (c) a ray through the centre goes straight through the lens

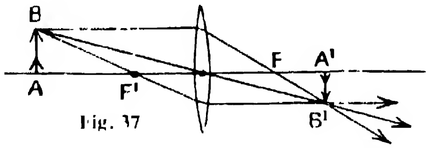


Fig. 37

All these rays pass through B^1, which is the real image of B, and A^1B^1 is formed. So long as AB is farther from the lens than F^1 there is a real image, which gets bigger and farther away as AB gets nearer F^1. The camera is in essence simply a lens or a group of lenses (Fig. 37), which is moved along the line AA^1 so that the inverted real image falls on the ground glass screen or on the photographic plate at A^1B^1.

When you use a convex lens of the kind shown in Fig 37, as a "magnifying glass," you place the lens near the eye and then adjust the small object you wish to examine at a distance from the lens a little less than the focal length. This has the effect of producing a virtual image which is much enlarged. It is seen in Fig. 38 how this is produced. The rays appear to the eye to have come from A^1 and B^1, since they diverge after refraction.

In principle, the astronomical telescope is a combination of the two instances. A lens of long focal length, called the object lens, is placed at one end of a tube pointed at the distant object, and a real image is produced in the tube. Then a second lens of shorter focal length is used to view the image. The second lens is arranged as in Fig. 38, e g the real image is placed at AB and a virtual image of this, again magnified, is produced. Variations of this combination of lenses are described in elementary books on light.

In the microscope the object to be viewed is well lit. the object glass, a lens of short focal length, is set at a distance from the object a little greater than the focal length. A real magnified image, produced a relatively long distance from the lens is then viewed by the eye lens, which acts simply as a magnifying glass on the real image and so produces a much magnified final virtual image.

The Spectrometer

This brief survey of refraction will be concluded with a description of the spectrometer, which incorporates most of the points that have been discussed. The instrument is used to produce spectra. It consists of three parts. (i) a *collimator*, which is a tube having a slit O at one end and a lens L^1 at the other. Since the slit is placed at the principal focus of the lens L^1 the light leaves as a parallel beam and falls on (ii) a *prism*, which is set to bend the light towards its base as already explained (*see* Fig. 34), and the light travels on as a parallel beam if it is of one colour, as seen in Fig. 39 (a).

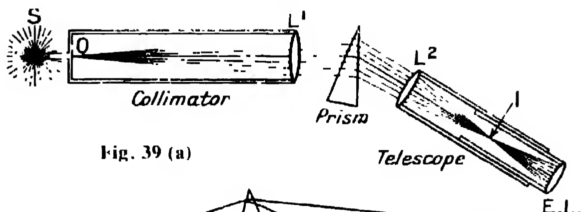


Fig. 39 (a)

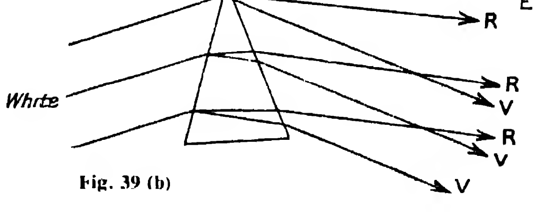


Fig. 39 (b)

The third part (iii), the telescope, which is set in focus for distant vision, sees the image I of the slit as shown in Fig. 38 (the rays are omitted in Fig. 39 (b) for the sake of clearness).

If a flame such as is given by a Bunsen burner or a gas-ring heats a block of kitchen salt the flame given is bright yellow. If this is used at S, a yellow image is seen in the telescope. If white light is used the red portion goes as a parallel beam in one direction, and all the colours of the rainbow each take their own path. The positions of the extreme rays are shown in Fig. 39 (b). The telescope focuses these parallel sets of rays as distinct images and the result is that one sees a spread of colour with red on the right continuously changing to violet at the extreme left (most deviated).

The general impression of this band of colour, which is called a *spectrum*, is of seven colour groups : red, orange, yellow, green, blue, indigo and violet. These colours are always in the same relative position. Some of the results which the study of such spectra yields to experimenters are considered in the next Lesson.

LESSON 11

The Composition of Light

LIGHT is transmitted as a transverse wave motion from the source to the receiver. The fact is very well established as a result of many ingenious experiments, some of which are described in Lesson 12. The velocity of light has also been found by experiment. For many reasons it seems fairly certain that this velocity, which has the remarkably high value of 300,000,000 cms per second (i.e. 186,000 miles per sec or 669,600,000 miles per hour), is the highest speed attainable.

Behaviour of Light Waves

Light comes through the tremendous distances between the remote stars and ourselves through a region in which no matter exists. This wave motion through empty regions led to the postulation of the ether, a purely hypothetical medium invented "to supply the subject of the verb to undulate."

Waves undulate or vibrate in something, and at the time of the commencement of the wave theory of light that "something" was labelled "the ether." Its properties were deduced and a large field of research began.

At the moment this line cannot be discussed further; our main concern here is the vibration called light. In empty space, light of all colours has the same velocity. The colour of an extremely distant star is identical when viewed from the rise of the same to the going down thereof. If one colour travelled faster than another, that colour would tinge the first appearance of the star; but it is not so.

When light enters a material medium it is slowed down appreciably. In some glass the velocity of light of all colours is reduced to about $\frac{2}{3}$ of the velocity in free space ; in water it is about $\frac{3}{4}$ of the free space value. It is found that the different colours are not reduced in speed by exactly the same amount, although it is of the same order. The greatest reduction in velocity takes place at the violet end of the visible spectrum, and the red light at the other extreme is the least reduced in speed in all straightforward cases.

The ratio called the refractive index is found to be equal to the ratio of

$$\frac{\textit{the velocity of light in free space}}{\textit{the velocity of light in the medium}}$$

As all the light has the same velocity in free space, it follows, since the refractive index of violet light is bigger than that of the red, that the velocity of the violet is less in any medium than that of the red in the same medium. It has been shown that when the light from an incandescent solid falls on a prism, in the way described in Lesson 10, there is a continuous change in colour along the spectrum which is produced. Because of the nature of the colour scheme this is called a *continuous spectrum*. It simply implies that the source gives out a whole range of colours, which the prism separates.

The velocity (c) is equal to the product of wave length (λ) and frequency (n), so that, for free space, one may calculate the frequency of each colour if one knows λ and c. This is constant for each colour and is a much safer reference than an eye estimate of the actual colour itself. When the light enters a medium, since the value of n is constant, λ changes within the medium. The deviation in the prism depends on the colour and must now be associated with the more precise index, namely frequency.

For one prism each frequency of light has its own deviation for a fixed angle of incidence. Thus the spectrum seen is a manifestation of a range of frequencies which, when acting together, give the impression of white light.

Line Spectra

If a source of light like an electric arc which is struck between two rods of iron is used, it is found that a continuous spectrum is not produced unless, by accident, the rods instead of the arc are viewed. In place of the continuous spectrum there is a set of lines each of definite

colour. It is just as though a selection had been made of certain colours or frequencies which is found to be absolutely characteristic of the particular source of light chosen. With an iron arc there are always the same lines (or frequencies) separated by black spaces where no light exists.

These lines are so definite that if lots of unknown rods of metals were used to produce a line spectrum the iron rods could be identified by means of the spectrum produced. Thus we have an infallible identification for the element.

Each element behaves in this way, i.e. each has its own line groupings. By use of the spectrum apparatus an atlas showing the lines for each substance can be made, using photographs instead of visual identification, and this atlas can be a complete guide in an analysis of metals. If two metals are used, the spectra of the two would be superimposed and both could be recognized. This is the basis of a method of analysis by spectral means.

Band and Absorption Spectra

Another characteristic form of spectrum is called the band spectrum. Here the lines are grouped together in the form of fluting or bands which are equally distinctive in analysis. More will be said of this in discussion of modern theories of atom and molecular structure, which can be supported by a study of the arrangement of the lines within the spectrum.

Dealing with line spectra, an example of the line spectrum of iron was taken. This is really very complex. Perhaps the simplest common spectrum of the type is that given when a piece of common salt is placed in a Bunsen flame or on a gas ring. The flame looks yellow, and if analysed by means of a good spectrometer it is found to be giving out two yellow lines, very close together in the visible region.

If white light from an incandescent source is sent into the spectrometer but on its way is made to pass through a cooler flame containing salt, the continuous spectrum has two vacant places which show up as black lines.

These occur in just the place where yellow lines appeared when the salt flame was used as a source. The spectrum is called the *absorption spectrum*, and the absent lines are just as reliable a guide to the cooler vapour contents as are the emission lines of the glowing sodium chloride flame itself.

Fraunhöfer Lines

An interesting conclusion was made on these lines from a study of the spectrum of the sun. If an image of the sun is focused on the slit of the spectrometer and a camera is made to take the place of the telescope, the photograph so formed is in general appearance very like that produced by an incandescent solid. Closer examination, however, shows that it is crossed by a large number of black lines, called the Fraunhöfer lines.

They are explained by the fact that the light from the sun comes from the incandescent core, which is surrounded by a cooler gas. The light passing through the sun's atmosphere is therefore robbed of certain frequencies, which are consequently absent when the light reaches the earth. Examination of these black "lines" led the physicist to a knowledge of the nature of these gases in the sun's atmosphere 93,000,000 miles away.

Well-known gases were identified. Some lines were still left over, and so new gases were discovered—at a considerable distance from the experimenters who found them. Helium has since been identified on the earth, but it was first found in the sun.

When a continuous spectrum is produced and the frequency of the visible light waves is measured, it is found that the extreme visible violet has approximately double the frequency of the extreme red. In sound, a note which has double the frequency of another is called the octave of that note. For this reason reference is made, by analogy, to the "visible octave" when speaking of the spectrum.

Ultra-Violet and Infra-Red

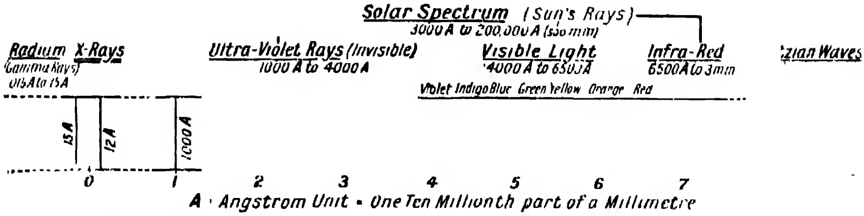
These waves which give the sensation of light are but a small fraction of the radiations emitted by a source. A photograph of the spectrum of, say, an ordinary carbon arc shows that lines are produced well beyond the limit seen at the violet end of the visible region.

These lines are said to be produced by the *ultra-violet* light. The ultra-violet light, whilst not affecting the retina, is very active in producing a photographic image. It has also the property of affecting the skin.

In winter, when the rays of the sun have to penetrate the longer air path in their oblique track to the earth, the ultra-violet light is largely cut off and consequently does not produce the same effect as in summer. From this it will be gathered that ultra-violet light is very easily absorbed. Ordinary window glass cuts off most of it, and it requires quartz or special glasses to allow a free passage for these rays.

Some sources of light are rich in ultra-violet light, e.g. iron and tungsten arcs, glowing mercury lamps (in quartz containers). Quartz prisms and lenses are used in spectrometers to deviate and measure ultra-violet light.

Beyond the red an invisible long wave-length radiation is given out. This is called *infra-red* radiation. It is very markedly strong in the heating effect it produces, and it is detected by sensitive heat recorders. Like ultra-violet light it has medical uses, and it can penetrate to a greater depth.



RADIATIONS. Spectrum extended in diagram form (not to any scale) to indicate relations of visible and invisible rays and ultra-short radio-active (gamma) rays to ultra-long wireless waves.

It will now be understood that the visible octave is only a small fraction of the energy sent out by a glowing solid. The "light" extends to many octaves and affects different senses. The wave motions here discussed are themselves only part of a very large family of similar radiations, which extend in wave-length from several miles (in wireless waves) down to one thousand millionth part of a centimetre (in radiation from radioactive bodies), and in all probability to a much more minute amount in cosmic rays.

LESSON 12

The Wave Theory of Light

THE visible octave which constitutes the range of electromagnetic waves that affect the retina of the eye forms only part of a large family of waves which may be detected because they affect one or more of the senses, or which may be detected by special apparatus (e.g. wireless waves). The radiations are electromagnetic waves, and their wave-lengths can be measured.

A source of white light sends out a band of wave-lengths from one value to double that value in all directions about the source. A monochromatic source sends out a very limited range of wave-lengths, which one might say has one value only, just as the modern wireless station sends out one wave-length only, whereas the old spark transmitting station sent out a band of waves which affected a wireless receiver over a wide range of tuning. To study the wave nature itself it is much easier, in almost every instance, to consider a monochromatic source and see what happens, and then see how this is modified when white light is used

Interference Effects

In Lesson 9 it was shown that, when conditions are right, two sets of waves act on each other, producing interference effects and diffraction or bending. In strings and the like the conditions are easy to produce, because it is relatively easy to have two identical sources of vibration, and the wave-motions produced are readily visible. In light, even in a monochromatic source, one is dealing with a complex thing.

What happens is that any particular point in the source sends out a train of waves for a short interval of time and then repeats this ; the source is not giving a straightforward, continuous output. To get interference one must reproduce the same source in duplicate and so get identical origins for two wave trains, and in these circumstances one is able to produce a large variety of interference and allied effects.

This was done by Augustin Jean Fresnel (1788-1827) in the following manner. A source of light illuminated a narrow slit S, and the light was allowed to fall on an arrangement (shown in Fig. 40) of two identical prisms placed base to base. This arrangement is called a biprism,

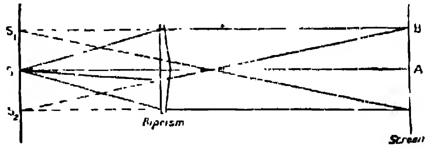


Fig. 40. Fresnel's experiment.

and the refracting angles of the prisms were equal and very small. The light falling on the prism was refracted as shown, and it appeared to come from S_1 and S_2, but in the region AB the two beams overlapped. Considered as waves, there are in the region AB two sets of identical waves in the same space, and therefore interference effects can be predicted.

Where the waves from the two beams fit together, crest to crest and trough to trough, double the amplitude is expected and, in fact, four times the brightness of the one beam ; but where the waves emerge together with a crest of the one joining a trough of the other the waves destructively interfere, and although the light beams are both there the net result is zero illumination. This experiment was made, and the interference resulted in a set of parallel fringes of alternately bright and dark bands.

The distance apart of these bands can be measured by viewing them through a

microscope ; and if d and D (*see* Fig. 41) are also measured, the wave-length of the light used can be calculated. Fig. 41 shows the essentials of the optical paths. S_1 and S_2 are the equivalent sources, OP is the screen or eye-piece of the microscope.

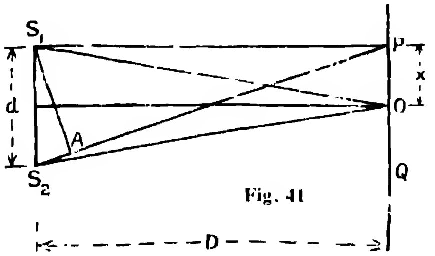


Fig. 41

Rays of light from S_1 and S_2 have the same length of path to O and therefore arrive in phase (i.e. crest to crest) and so produce an addition of their individual amplitudes. As we pass up the screen to P the illumination will depend on the length of the path difference (S_2A in Fig. 41). If S_2A is just half a wave-length the two rays will arrive half a wave-length out of phase and will neutralise each other, i.e. they will produce darkness.

As P moves out from O it is fairly clear that AS_2 will gradually get bigger and so contain, in turn, a length equal to ½, 1, 1½, 2, 2½, etc., wave-lengths; and so it is to be expected that the illumination will be alternately dark and light, as Fresnel found to be the case. It can be shown quite simply that when:

$\frac{D}{d} \cdot \lambda$ there is the first dark band

and when $x = \frac{D}{d} 2\left(\frac{\lambda}{2}\right)$ there is the first bright band, and so on.

Therefore, if D, d and x are measured, λ, the wave-length, can be calculated. In this way the value is found to be 5.89×10^{-5} cm. = ·0000589 cm. for the yellow sodium light (actually this is composed of two wave-lengths: 5.8899×10^{-5} and 5.8959×10^{-5} cm.).

In all the foregoing a monochromatic source has been assumed; if white light, which is a mixture of wave-lengths, is used to illuminate the biprism the maximum and zero illumination produced by the yellow component will be precisely in the same place as when that colour only was used as source. But, in addition, each colour in the white light beam will produce its own effect, which is similar in nature, but differs in magnitude because of the difference in wave-length.

It seems obvious that when considering the large red rays the first bright line will occur in the screen when AS_2 is equal to one wave-length of the red, i.e. it will be farther away from O. In the same way, the blue will give its maximum at a point nearer to O. In fact, there is a band of colour about the white centre at O. In all instances the effects already considered in the direction towards P will occur symmetrically towards Q, of course. But although many bands are obtained from a monochromatic source it is found that with white light the fringes soon cease because there is overlapping of the colours, producing a general white illumination, in a very small distance after the first set.

One might be tempted to suggest that these results seem very like those of ordinary refraction through a prism, as considered in Lesson 10, but the positions of these colours do not agree with such an explanation; and, further, the same scheme of things can be produced by other means without prisms, which in this case were used simply to obtain two similar sources.

Soap-film Colours

Perhaps the best-known example of the effects of the interference of light is the colour produced in soap films and soap bubbles. The magnificent hues seen on the bubbles blown from a pipe, or on the bubbly surface of soapy water, are brought about by the interference of the white light which falls on the very thin films. Considering a very much magnified section of a soap film, it is seen that light falling on it can suffer reflection at the first surface (Fig. 42); then, of the light which is refracted into the soap film some is reflected at

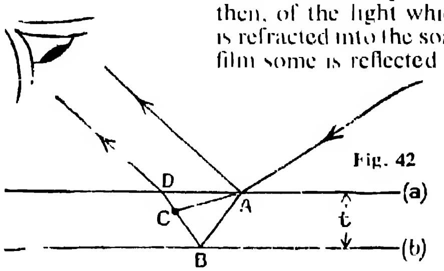


Fig. 42

the surface (b) and will emerge, as shown, parallel to the first ray.

When one thinks of a wide beam of light as being incident, instead of one ray, one finds that the reflected beam is made up of millions of rays, some of which have been simply reflected at (a) and an equal number reflected at (b).

What an eye sees by these reflected rays depends greatly on the way in which the two sets of rays behave when they unite. If the extra path, ABC, which the one set of rays has to travel is equal to a whole number of waves it would be expected that the two sets of rays would reinforce, crest to crest, and produce a brightness. In fact, when reflection takes place at a more dense medium from air, as at (a), there is introduced the equivalent of half a wave-length path difference; whereas at (b), where the surface separates a more dense medium

(soap solution) from a less dense (air), there is no such change of phase.

Thus the mere difference in the nature of the reflection surface introduces a path difference, and therefore it is found that if the path ABC is a whole number of waves in length the light of this wave-length destructively interferes and neutralises.

That is, in this direction there is no light of the colour corresponding to the particular wave-length, and if white light is incident the reflection is devoid of this one colour and therefore the complementary colour (i.e. white minus this particular colour) is produced and the film appears to be coloured. The colour will change when the thickness of the film changes, because the extra path ABC is thereby changed and so is the wave-length which interferes at this particular path difference

Again, if the path difference is a whole number of waves' lengths plus a half-wave of one colour, this will be reinforced at the particular angle which gives this condition, and there will thus be an excess of one colour on a white background. In both ways the reflected light gives rise to colours. In light which goes through the films the colour seen is the complementary colour to that given by reflection.

If the colour-changes in a soap bubble are observed it will be found that change is continuous as the film gets thinner When the thickness is very greatly reduced, it is seen that a large area has the same colour, which in turn becomes red, then changes to blue through all the intermediate colours of the rainbow. When the film has become very thin a black patch appears and gradually spreads over the bubble, which at this stage might break at any instant.

Of Near-molecular Thickness

The black patch means that the thickness of the bubble has been reduced to something much less than the wave-length of blue light, i.e. of the order of less than 00004 cm. In fact, the path difference between the two reflected rays is negligibly small (only a minute fraction of the wave-length of blue light), the difference in phase caused by reflection at the upper surface introduces a path difference of half a wave and all waves therefore interfere, and the perfectly black spot is obtained. The film is only a few molecules thick at this stage

The same explanation accounts for many colour schemes, such as those produced by thin oil films on the surface of water. The colours of opals and gems of the same kind, butterflies' wings, peacock feathers and the like, can all be explained in terms of interference, as such, or in terms of an allied effect which is called *diffraction*. The difference between interference and diffraction is quite arbitrary: the methods of measurement are similar.

Before dealing with this other interesting phenomenon there is one particular form of interference fringe system which is worth consideration because of its wide application. If one takes a curved surface and puts it in contact with a perfectly plane surface it is found that the coloured rings called Newton's rings appear when illuminated with white light.

Newton's Rings

Instruments called *interferometers* have been devised to produce these rings, and to measure by their aid the dimensions of small objects and the change in length of longer objects when subjected to change of physical conditions.

If one takes a piece of good plate glass and rests a weak convex spectacle lens on it and illuminates it with white light, the rings appear.

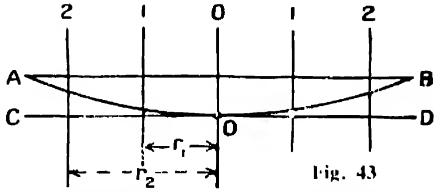


Fig. 43. A convex lens and plate glass producing Newton's diffraction rings, a simple form of interferometer.

If the light enters at right angles to the plane, as at 0 1.2 in Fig 43, it is clear that ray 1 can reflect at AOB or at CD These reflected rays, coming together, reinforce or interfere if the path difference is half a wave or a whole wave, and so produce rings of light or darkness about O, as the path difference is the same in a circle about O.

If monochromatic light is used bright and dark rings of the colour used are produced. If CD moves away parallel to itself, it is seen that the rings appear to move in or out. For a movement of CD equal to half a wave the path difference made is a whole wave, and so the rings seen move so that they take the place of their former neighbouring rings.

This is used to measure small movements in physical and engineering practice. It has the virtue of enabling an accurate measurement to 000005 cm. with a beam of light reflected from the apparatus itself The interferometer has important applications in astronomy in the calculation of star distances.

When the properties of waves were discussed in Lesson 9, it was seen that in cases of water waves the motion was able to go round a small obstacle, Fig. 44 (b), whereas a long breakwater casts shadows, Fig. 44 (a). If water waves are directed to an opening between two obstacles they pass through, not only in the original direction but in a fanlike direction, spread outwards, as shown in Fig. 44 (c).

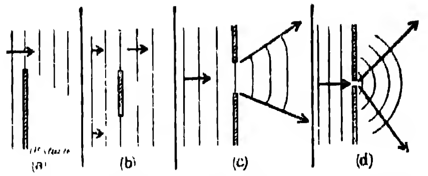


Fig. 44. Behaviour of wave in water passing between obstacles.

If the opening is small, as in Fig. 44 (d), the water waves pass outwards in circles. It will be found that the smaller the opening as in Fig. 44 (d) the more complete are the circular waves set up on the side remote from the disturbance.

In the case of light, all the results which have been shown in this Course up to now appear to fit in with a wave propagation. But if the experiments shown in Fig. 44 be performed with light instead of water waves the type of result does not appear—at first sight, at any rate—to agree with the results given in these cases for water waves. Fig. 45 shows the expected results

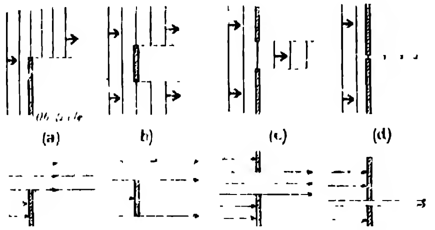


Fig. 45. The upper figures represent wave fronts, the lower figures the corresponding rays of light, using obstacles and apertures the same as in Fig. 44 : (a) a long obstacle; (b) a short obstacle; (c) a wide opening; (d) a narrow opening.

At one time it was believed that this apparent disagreement was a decided blow to a wave theory for light. It was therefore a matter of great scientific interest to see whether light by any chance behaved as in Fig. 44, to some degree, and to explain the bulk disagreement. There is a very important difference between the two waves. Water waves are long ; light waves are very short.

In the water waves in Fig. 44 (b), for example, the size of the obstacle is comparable with the wave-length, whereas in Fig. 45 (b) the obstacle is some hundred thousand times as great as the wave-length. The same can be said of the opening between the obstacles in Figs 44 (d) and 45 (d).

To make a fair comparison it seems desirable so to reduce the size of the obstacle, or the opening, as to be at any rate of the same *order* as the wave-length of the light used, and then to see if the bending of the light waves takes place, as shown in Fig. 44 for water waves.

One is so accustomed to recognizing that light travels in straight lines that it comes as a mild shock to find that when one deals with extremely small openings there appears to be a variation from this rule. For example, if the sun is shining on a room darkened by means of a black blind and there is a very minute pin prick in the blind one is able to see the sun shining at the small pin-prick even when the eye is not in a straight line with it and the sun—in fact, the light will reach the observer in almost all directions if the hole is small enough ; and so one has an experimental realization of the water wave case illustrated in Fig. 44 (d).

The question which then arises is, "Why should a very small portion of the wave front behave differently when separated from the rest of the wave ?" The suggested answer is that it does not do so ; that, in fact, all points of the wave send out new waves, but owing to interference all one realizes when the full wave is present is the new wave front, parallel to the old.

Looking more carefully into the shadow cast by an object with a straight edge in a darkened room, one finds that there is no sharp line of demarcation between brightness and darkness, but that a gradual shading off to zero light takes place within the shadow.

Further, it is found that near the edge of the shadow, in the part which appears to be bright to the naked eye, there is a fluctuation of intensity of the light, forming a set of straight line fringes parallel to the straight edge and rapidly closing up into the general illumination. Of course, all these fluctuations, etc., take place in a very small distance.

For example, at a distance of 1 metre from the straight edge all the fringes are seen in a distance of 0·3 cm., and the diffraction, or bending, of the waves is therefore very small indeed ; but so is the wave-length of the light.

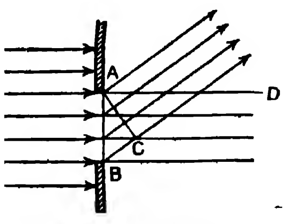


Fig. 46. Production of diffraction fringes.

The point is perhaps best studied in the case of a narrow slit on which a parallel beam of light is falling. As seen in Fig. 46 there is no doubt that a direct beam goes through, but if each point across the slit AB sends out waves, as in Fig. 44 (d), the illumination in any other direction simply depends on what is the result of all the secondary waves from AB in the direction chosen.

It can be shown that if BC is equal to half a wave-length of the light used there is reinforcement and the light so formed can be viewed by means of a telescope. When BC $= \lambda$ there is

darkness ; when $BC = 1\frac{1}{2}\lambda$ there is a second bright light, and so on. In fact, there are bright and dark *diffraction* fringes arranged symmetrically about the "straight through position" shown. The positions of these fringes depend on the colour of the light used, the red light diffraction fringe being at a greater angle than the violet. Once more colours are produced when white light is used to illuminate the slit.

Diffraction Grating

A device for measuring the wave-lengths of light and for producing spectra is the *diffraction grating*. In one form this consists of a flat glass plate ruled with equidistant parallel lines which may number 20,000 to the inch. Light falling on the grating is diffracted at an angle which depends on the colour of the light used ; the angles are bigger for the longer wave-lengths. The result is the production of a spectrum ; the same thing occurs at an angle almost double the first and the colours are twice as far apart. If conditions permit this is again repeated to produce *spectra of the 1st, 2nd, 3rd, etc., order*.

There are two kinds of wave motion, as was seen in Lesson 9, but the experiments described so far do not differentiate between the two, as both exhibit interference and diffraction.

Light waves are transverse, i.e they vibrate at right angles to the direction of motion of the wave. If a stretched cord is passed through two slits, S_1 and S_2, and the end A is vibrated in all directions at right angles to the cord (*see* Fig. 47), it is found that only those vibrations which are parallel to slit S_1 are able to pass through it ; if the slit S_2 is arranged at right angles to S_1 it is found that the cord at C is not moving. The waves between S_1 and S_2 are being *plane polarised*, i.e. vibrating in one plane only. If light is a *transverse* vibration it may vibrate as does the string at A, and it should be possible to produce plane polarisation. This is shown to be so in the next paragraphs.

Polarisation of Light

Various ways have been found to accomplish this. A crystal of tourmaline has the property of splitting light into two vibrations at right angles ; it absorbs one of the vibrations and transmits light vibrations in one plane only like the string at B in Fig. 47. Tourmaline acts to light as the slit S_1 does to the string. When ordinary light has passed through such a crystal and becomes plane polarised it does not appear different from ordinary light.

But if a second crystal of tourmaline is placed in the path of the plane polarised light it is found that as the second crystal is rotated it comes to a position when its axis is at right angles to the first (the crystals are said to be "crossed") and all the light is cut off. The beam of a powerful arc lamp cannot penetrate these two crossed crystals, which are transparent separately or when arranged together with their axes parallel—a striking proof of the transverse character of the wave motion called light.

The Nicol Prism

A crystal of Iceland spar can also split ordinary light into two components or parts which vibrate in planes at right angles. In this case the spar does not absorb one half like the tourmaline. It is found that the two rays in the crystal are plane polarised in planes at right angles to each other and that one ray obeys the ordinary laws of refraction.

The other ray does not follow the same laws, and is aptly called the "extraordinary ray." In general, the two rays separate in going through the crystal and when the light comes out it is doubled. If such a crystal is placed on this print a double set of images is seen through the clear crystal, as shown in Fig. 48. If these images are again viewed through tourmaline they disappear in turn when the axis of the tourmaline is turned through a right angle.

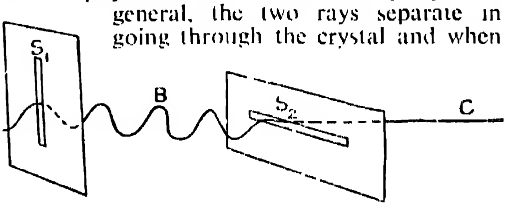


Fig. 47. A practical experiment to show how light waves vibrate at righ angles to the direction of motion of the wave. Direction of vibration at A in all directions, B in one plane, and C no vibration.

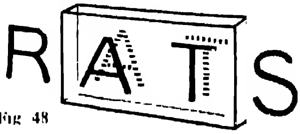


Fig 48

By a simple method, too long to describe here, it is possible to construct a Nicol prism with a rhomb of calcite (Iceland spar) ; this allows the extraordinary ray to pass through but cuts off the ordinary ray ; and so ordinary light when passed through the "prism" is plane polarised, and is not tinted green as when a tourmaline crystal is used. Using a Nicol prism to analyse the light reflected and transmitted through a sheet of glass, it is found that the light is split up into two beams polarised at right angles.

By means of special optical glass which transmits light vibrations only in one plane, it is possible to reduce glare due to scattered light rays, and this principle is used in some sun glasses and night-driving glasses. The "3-D." of modern cinemas depends upon the fact that light can be made to travel in one plane.

LESSON 13

Physical Aspects of Sound

Continuing the survey of the elements of Physics, some of the physical aspects of sound—how it is produced and propagated, and something of its nature—will now be considered.

The first essential for a sound is, of course, the source or starting point. Musical notes produced by a tuning fork, a piano, an organ, a violin, a saxophone, or a noise such as is produced by a pneumatic drill, all have one common feature - a source of vibration. The vibration of a tuning fork, the string of a piano or a violin, is fairly apparent; in wind instruments the only possible substance to vibrate is the air within the tubes—which, in fact, does vibrate and so produces the characteristic note of the instrument.

Sources of Sound

Assuming that the vibration in the source is the starting point of the sound, the question arises: how does the vibration change to produce the different notes which are emitted, on the one hand, or the mere *noise*, on the other? It is found that the size of the source determines the pitch of a musical note; why, then, does change in the size of the source produce difference in pitch?

In the first place, all sources of musical notes give out regular vibration of a definite frequency (i.e. number of vibrations per second). One definite pitch corresponds to a definite frequency. For example, if a source vibrates in a regular manner 256 times per second the note given out is the middle C (on some scales this number is modified slightly). In other words, pitch is associated with the frequency of vibration of the source.

Mathematically it is possible to calculate the frequency of vibration of a string of a given material of known thickness and length when stretched with a known tension; it is found that the frequency (n) is proportional to the square root of the tension and is inversely proportional to the length and the square root of the mass per centimetre. In other words, if the tension of the given string of a fixed material is constant the frequency is inversely proportional to the length, i.e. on doubling the length the frequency is halved and the pitch made an octave lower.

Complex Vibrations

Similar rules can be deduced to apply to columns of air, and vibrating plates such as telephone diaphragms. Some sources vibrate in a complex manner. In a violin string there is, in addition to the simple vibration, a possibility of other waves of half and other simple fractions of the length of the first being superimposed on it. These *overtones* give the distinctive note of a violin.

In a noise there is no *regular* vibration and the frequency emitted is an assortment of a vast number of individual frequencies, each of which would produce a musical note but together result in *noise* only.

Sound Waves

It has been shown that the source of sound is a vibrating body. To be considered now is how the vibration sets up "sound waves," which travel from the source to the listener. Consider a tuning fork vibrating in a regular manner; the prongs of the fork will compress the air as they move outwards and will endeavour to rarefy the air as they move inwards, thus giving rise to a pressure wave in the air. In this way the maintained movement of the fork is communicated to the air.

The fork itself vibrates in S.H.M. (*see* Lesson 9), and so does the air particle next to it. The air particles in the neighbourhood gradually take up a S.H.M., but the phase of the vibration differs as we consider particles more removed from the source. In other words, there are here all the conditions for the production of wave motion, as was discussed in Lesson 9. The great difference to be noticed between this wave and light waves is that the air particles vibrate in the direction in which the wave is moving.

As previously stated, the alternative way of regarding this is to consider the pressure set up by the moving air particles. No *transverse* S.H.M. movement is possible, because there is no force set up in air or liquids to restore such a transverse displacement; but a movement in the line of propagation can be propagated, for the movement itself sets up a force which restores the particles to their original position.

Wave Movement of Air Particles

The picture of a sound wave in air is of propagation by the movement of the individual air particles, each about a position of rest; the particles have a phase difference in their movement which results in compressions and rarefactions of the particles. In no circumstances do we visualise transverse movement. It is to be noted that for a sound wave in air it is the *air* which moves; the same in water, wood, wires, etc. This is again different from light. Here the material medium is the transmitting agent.

It can be shown that sound requires a material medium for its transmission. Hang an electric bell in a glass vessel, using the wires as support,

and then apply an air pump to withdraw all the air from the vessel : the noise of the ringing bell becomes fainter and fainter as the air is withdrawn. When there is almost a vacuum in the glass vessel the sound is almost inaudible. All the time the bell hammer can be seen hitting the gong, i.e. light can be transmitted through the vacuum, but not sound.

Velocity of Sound

Sound travels through air at 0° C. with a velocity of about 1,090 ft. per second or 331 metres per second, and not with the tremendous velocity of light. The early determinations of velocity were made by observing a distant flash of a gun firing and by noting the time which elapsed before the sound was heard a measured distance away.

It is the reverse process to that used as a method of estimating the distance of a thunderstorm, in which the number of seconds between seeing a flash of lightning and hearing the corresponding roll of thunder is recorded. In each 5 seconds the sound has travelled 5,450 ft., which may be taken as approximately one mile (5,280 ft.), i.e. the distance from the storm, the time taken by light being negligible.

Sound travels in different substances at different speeds, as in the following table :

Speed of Sound in Four Substances

Substance	*Velocity (approx.)*
Air at 0° C. . .	331 metres per sec.
Water .	1,400 ,, ,, ,,
Steel .	5,000 ,, ,, ,,
Wood (pine, deal)	3,300 to 4,900 ,, ,, ,,

It is possible for an observer to see at a distance a hammer strike a railway line, then to hear the sound which has travelled along the steel, and then, a little later, hear the sound carried through the air.

The relation between wave-length (λ), frequency (n), and velocity (v) is $v = n\lambda$, as before ; therefore in air the wave-length of middle C (n 256) is 33,000/256 cm., i.e. almost 129 cm. In other words, the wave-length is fairly long. Such things as reflection, refraction, interference, and diffraction are to be expected with these waves, of course, and the general order of results is that anticipated with long waves.

Remembering the effects discussed in Lesson 12 it will be realized that the bending or diffraction of sound round buildings is what is to be expected with the waves, and that the lower the note is, the longer will be the wave and therefore the bigger these effects. An example of reflection is in echoes, when sound is reflected by mountain faces, etc.

Interference of sound waves can be demonstrated by using the apparatus illustrated in Fig. 49. It consists of two tubes A and B, which slide within each other, trombone fashion. At

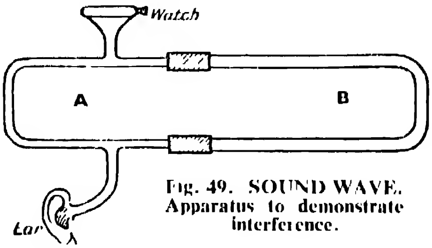


Fig. 49. SOUND WAVE. Apparatus to demonstrate interference.

an opening on one side a watch is used as source ; at a corresponding opening at the other side the ear listens to the sounds. When B is pushed in so that the sound has an equal path each way, i.e. via A or B, a loud tick is heard, but when B is pulled out a position is reached when virtually there is no sound. The path via B has been increased by half a wave-length of the note given out, and interference of the waves has dimmed the intensity.

LESSON 14

Basic Principles of Magnetism and Electricity

In the preceding Lessons the outlines of mechanics, properties of matter, heat, light, and sound have been considered. To complete the survey of the wide subject of physics some of the chief properties of magnetism and electricity will be stated.

This allied pair of subjects is of great importance to the physicist because of the far-reaching nature of the results of practical investigation and theoretical speculation.

The text books recall that the beginnings of magnetism are to be found in a discovery of great antiquity ; certain magnetic oxides of iron were observed to have the property of setting always in one direction when freely suspended. These magnetic ores were used in much the same way as a compass is now used, and they acquired the name of " leading stone " or lode stone. They are, in fact, naturally occurring magnets.

Properties of Magnets

If a piece of iron or steel is rubbed, always one way, with such a lodestone, the iron or steel itself becomes a magnet (an " artificial " magnet). These artificial magnets in turn can impart their magnetic power to pieces of iron and steel by exactly the same process.

One common feature of both sorts of magnet is that they attract to themselves small pieces of

iron and steel No doubt the earliest memory most of us have of magnetism is of using a horse-shoe magnet to attract needles or tin tacks (Fig. 50). Large numbers of these adhere to the ends marked N and S when brought near the magnet.

In a laboratory the ordinary bar magnet is most often used. If this is placed on a sheet of paper and then covered with iron filings, it is found that when the bar is lifted the filings adhere in two tufts (Fig. 51) round the two ends- the *poles* just as the tacks remained only at the ends of the horse-shoe magnet.

When a bar magnet is hung so that it can swing freely in a horizontal plane one end always points north. The pole at this end is called the north-seeking pole (N pole), the pole at the other end is the south-seeking pole (S pole).

If the N pole of a magnet is taken near to the N pole of the suspended magnet the latter turns away: it is repelled. If a S pole is brought near to the S pole of this suspended magnet this also is repelled, but a N and S attract each other. This is summarised by saying that "like poles repel, unlike poles attract" Obviously the force of repulsion or attraction depends on how strong the two poles are and how far apart they are.

Magnetic Field

A magnetic pole is said to have unit strength when it exerts a force of 1 dyne on an equal pole placed 1 cm. away from it in a vacuum. If two north poles are of strengths m and m^1 and are separated by a distance of d cm. the force of repulsion (F) is given by:

$$F = \frac{mm^1}{d^2}$$

This expresses the *inverse square law*.

To account for the fact that one magnet tends to turn or attract, it is said that in the space around a magnet there is a *magnetic field.* Take a bar magnet and cover it with a sheet of glass and scatter iron filings on the glass; after tapping the glass gently in order to allow the filings to turn a very definite picture is obtained. The iron filings take on the form of Fig. 52. If a horse-shoe magnet is used, the result is as in Fig. 53. The filings map out the *magnetic fields* of the magnets in each instance.

If a unit north pole were placed near the N pole of either magnet in Figs. 52 or 53, the N pole would go to the south pole and it would in fact travel along the line marked out in the figure. The lines are *lines of magnetic force*. The line of magnetic force is the path a freely moving N pole would take if placed near the magnet.

If there are a lot of lines in a given area, the magnetic field is strong. If there are few lines, the magnetic field is weak. The actual magnetic field at a point is defined as the force in dynes which acts on a unit north pole placed at the point. Like all forces on unit poles or anything else, there is a direction as well as magnitude; arrows are used to indicate this (*see* Fig. 53).

If a piece of iron or other metallic material is introduced into the field of the magnet, i.e. into a region containing these lines

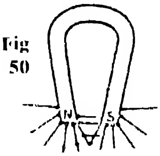


Fig 50

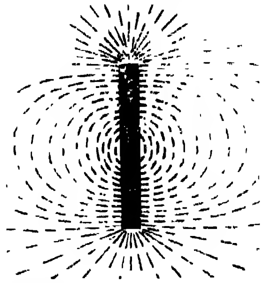


Fig. 52

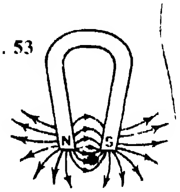


Fig. 53

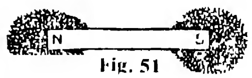


Fig. 51

MAGNETIC FIELDS

of magnetism, the lines will be diverted towards the piece of iron and will pass through it in preference to the air It is the passage of these magnetic lines through the iron that causes it to act as a magnet.

The greater the number of lines passing through the magnet the greater is its force of attraction or repulsion. The number of lines of magnetism per unit of area of cross-section is called the "flux density," and this represents the degree to which the body has been magnetised.

Soft iron presents an easy path for magnetic lines: in other words, it is easily magnetised. It is only a temporary magnet, however, because when the source of the magnetism is removed the piece of iron loses all its magnetic properties. A piece of hard steel, on the other hand, is not easily magnetised, but when it does become magnetic it will retain this property for some considerable time; that is, it becomes a permanent magnet.

However useful and valid it is to talk of unit N poles in theoretical problems, and as convenience in defining fields, etc., no such thing can be isolated in practice. For example, if a steel hack saw blade is magnetised and then broken into two in an attempt to isolate the N pole

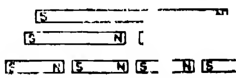


Fig. 54. Molecular magnets.

and the S pole, it is found that two complete magnets have resulted. Again, if each half is broken to make two quarters each quarter is itself a complete magnet, as shown in Fig. 54. The conclusion is reached that in iron

and steel the molecules are magnets which are in general arranged in a haphazard fashion. When stroked with a magnet the molecules align themselves in one direction, so that however small the portion which is broken away from the main magnet the molecules, being in alignment, show north and south polarity in the segment of steel detached.

Magnetic Action of the Earth

To return to the question of the magnetic fields, the assumption is that whenever a field is applied to a magnet it causes a force to act on the magnet. In terms of this definition it is said that in the first place a magnet sets in the meridian because there is a magnetic field due to the earth. In fact, the earth produces magnetic effects which are the same as if a huge magnet had its S-seeking pole near the north geographic pole and its N-seeking pole near the south geographic pole.

No such magnet exists, of course, but the magnetic field around the earth is similar to that which would be produced by such a distribution of magnetic poles. Over an area so small as England (compared with the area of the earth) the magnetic lines of force may be taken as parallel, and the field is said to be uniform.

Suppose the strength of this magnetic field is H dynes per unit pole (or H *gauss*) and that a magnet is pivoted so that it can rotate in a horizontal plane, it is clear that when the magnet is not setting in the magnetic meridian (i.e. the direction of the earth's line of force) it is acted on by forces which tend to turn it to there. For example, suppose H in Fig. 55 is the direction of the earth's horizontal magnetic field, and NS is the position of the magnet. The magnet has two poles at N and S each of the same pole strength, say m units. The force at N on the pole there is $H \times m$ (since by definition H is the force on *unit* pole).

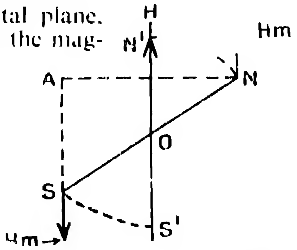


Fig. 55. Force due to earth's magnetic field.

A similar force acts at S in the opposite direction and so these forces produce a turning couple which will tend to move the magnet round until it lies along N'S', where the two forces are acting in the same line and are opposite in direction.

If a uniform magnetic field of strength F now acts on the magnet, in a direction at right angles to that of H, the magnet will turn round through some angle, say $\theta°$, from the meridian, and it can be shown that the strength F and force H are related by the expression :

$$F = H \tan \theta$$

This relation can be used to compare field strengths due either directly to magnets or, as will be shown later, to electric currents.

Electrification

The word electricity is derived from the Greek *elektron*, meaning amber. The earliest recorded method of producing electricity was by rubbing amber with fur or flannel.

When any two different substances are rubbed together electricity is produced by the friction. If an ebonite fountain-pen is rubbed on the coat or on the hair, the pen acquires the property of attracting light pieces of tissue paper towards it.

If a light gilded ball of elder pith is suspended by means of a dry silk thread and brought near to a glass rod which has been rubbed with silk, the ball is attracted to the rod and then is repelled. Any attempt to take the rod near to the charged pith ball results in repulsion.

The same sequence of events is witnessed if an ebonite rod rubbed with flannel replaces the glass rod, but the ball charged from the glass rod is subsequently attracted by the ebonite rod. Of the two kinds of charges the one on the glass is called positive, the one on the ebonite is called negative; and it is established that "like charges repel and unlike charges attract." In the process of producing a charge by friction equal positive and negative charges are manufactured from the two uncharged bodies.

In rubbing ebonite with flannel the positive charge goes to the flannel and the negative to the ebonite, whereas with glass and silk the positive goes to the glass and the negative to the silk. If two equal charges of + and − values are mixed, the net result is no net charge.

When a charge is hung up by means of a wire or a damp silk thread the charge is conducted to the support and leaks away. When insulated, the charge remains on the pith ball.

As with magnetic poles, which obey similar laws, a unit positive charge can be defined as "that charge which will repel an equal charge, when one centimetre away in a vacuum, with a force of one dyne". A similar inverse square law can be deduced; if two charges of q and q^1 are d cms. apart the force (F) of repulsion in dynes is given by :

$$F = \frac{q\,q^1}{d^2}$$

Electric-field strength at a point is defined as "the force in dynes which acts on a unit positive charge placed at that point"; e.g. if a charge of +10 units is placed in a uniform electric field of 50 dynes/unit pole the force acting on it is $10 \times 50 = 500$ dynes.

If there are two charges of opposite kind, positive and negative, and they are joined together by a conducting path, e.g. a wire, it is found that positive electricity flows from the

positive to the negative, and it is said that an electric current is flowing. This lasts for only a very small interval of time.

If a positive charge is joined by a wire to the earth, a current of electricity flows to the earth and the body lóses its charge, whereas when a negative charge is joined by means of a wire to the earth, the current flows from the earth to the body, and the flow, which is almost instantaneous, discharges the body. The earth is taken as zero in these cases. The free negative charge has a negative potential, and the free positive a positive potential, and the earth is said to be at zero potential

If two bodies charged with positive electricity are joined together by means of a wire there will in general be a flow of electricity (a current) from the body at the higher potential to the body at the lower potential. In dealing with a sphere it is found that the potential is equal to the charge on it divided by the radius of the sphere.

This is deduced by defining potential in a quantitative manner as being equal to the work done in bringing up a unit positive charge to the body from a long way away (infinity). It may be taken as axiomatic that if an electric potential difference exists on a conductor there will be a flow of electricity from the place at the higher to the place at the lower potential, which tends to equalise potential.

Law of Electric Charges

The law of force between charges is similar to the law of force between magnetic poles. If a sphere is charged the effect on outside charges is as though the charge was concentrated at the centre. For example, if a large region of space has a charge Q spread evenly throughout a volume of radius R, then at any point outside the sphere the force is the same as if Q were at the centre of the sphere. If a charge q units of the opposite sign be placed a distance d away, the attraction is :

$$\frac{qQ}{d^2}, \text{ so long as } d \text{ is greater than R.}$$

For points within the distance R the force is no longer governed by this result, for within a charge there is no force from that charge. In Fig. 56, which illustrates this, there is no force on q at P due to the part of the charge Q which is in the vertical shading, and the force is given by the inverse square law as :

$$q \; \frac{(\text{charge within sphere of radius } d)}{d^2}$$

The enclosed volume is

$\frac{4}{3}\pi d^3$, which is a fraction of the total volume, $\frac{4}{3}\pi R^3$,

which is obviously $\dfrac{\frac{4}{3}\pi d^3}{\frac{4}{3}\pi R^3} = \dfrac{d^3}{R^3}$

and therefore since Q is uniformly spread throughout the volume the charge within the small sphere is :

$\dfrac{d^3}{R^3}$ Q, and so the force q is

$$Q \qquad d\left(\frac{Qq}{R^3}\right)$$

that is, the force within the charge is directly proportional to the distance from the centre. This is again analogous to what happens in the gravitational case for any two portions of matter.

Potential and Capacity

An electric charge raises the electric potential of a body just as a quantity of heat raises the temperature of a body, or a quantity of water raises the level or pressure in a container. The "electric temperature," or "electric pressure" as potential is sometimes called, exists in stationary charges and also by our definition is present to cause a movement of charges, when we say that a current flows. It must be maintained as long as electricity is to pass.

Consider first the stationary charges. When a sphere of radius r cm. is given q units of electricity, the potential may be calculated to be q/r. It will be apparent that if the charge is divided by the potential the radius ($q \div q/r = r$) is obtained. In all cases it is found that if a body is fixed in space the ratio of

$$\frac{\text{charge}}{\text{potential}} \text{ is a constant}$$

which is called the *capacity* of a body.

It has been noted that the electrical capacity of a sphere is equal to the radius. The capacity can be increased by increasing the area of the body, by bringing another earth-connected body near the first, and by displacing the air between the two bodies by inserting shellac, glass, mica, etc. This arrangement is called a *condenser* or *capacitor*, and it is usually made with parallel plates which are separated by waxed paper or sheets of mica. In the *air* condenser the plates are separated by air. In wireless variable air condensers the capacity is changed by rotating the plates so that a change in the area of the facing plates is brought about.

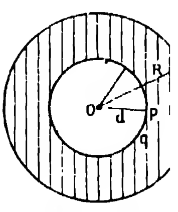


Fig. 56. Electric capacity of a sphere.

The Electric Cell

Considering the movement of charges due to a difference of potential, it is found that if two stationary charges at different potentials are joined a current flows until the two potentials become equal. This is almost instantaneous in action. To maintain the current the potential

difference must be maintained. The friction methods are abandoned for most practical purposes and use is made of the fact that when any two dissimilar metals, suitably chosen, are placed in a dilute acid, a potential difference is set up which is maintained even when a current flows, as shown in Fig. 57, which is a typical example of a simple *cell*. In practice it is found that the cell soon polarises (i.e. bubbles of gas appear on the copper plate in Fig. 57, and so increase the resistance that the current stops) and special modifications are introduced to overcome the difficulty. Accumulators, or secondary cells, which can be charged with electricity, provide a source of constant current.

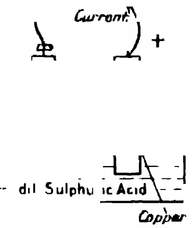


Fig. 57. Diagram of simple electric cell.

If any form of cell or battery is taken and a current allowed to flow by joining the poles, + and −, by means of a wire, several effects are produced by this current. There are: 1. Magnetic effects. 2. Heating effects. 3. Chemical effects, etc. In addition, when acted on by a magnetic field, an important interaction is produced.

When a current is passed along a wire, the region about the wire has a magnetic field set up in it in the form of circular lines of force. In Fig. 58 the dot represents the section of a wire conveying a current into the plane of the paper; the magnetic field is represented by the circles. If the current is reversed the magnetic field is reversed. There is a simple rule to determine the relative directions of the magnetic field and the current, called the *corkscrew rule*. Imagine that a corkscrew is being driven in the direction of the current, then the direction of rotation gives the direction of the magnetic field.

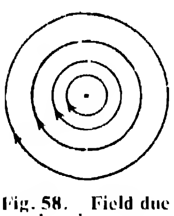


Fig. 58. Field due to electric current.

If a wire is bent into a circular coil and a current passed through it the magnetic field is still in circles about the wire; i.e. if planes are drawn at right angles to the *wire* the field is in circles in the plane. So that at the centre of the coil of wire the magnetic field is at right angles to the plane of the coil, and it is made up of the effects produced by each bit of current in the wires. The mental picture of the magnetic field is somewhat like the smoke in a smoke ring. This magnetic effect can be made use of to define current, so that there is a unit for measurement. It is defined in terms of the strength of the magnetic field it sets up. It was found by experiment that the magnetic field due to a short length l of conductor conveying a current was proportional to the length and inversely proportional to the square of the distance, r, away from the wire, as well as to the current itself, and therefore at the centre of a circular coil of wire of radius r the magnetic field, F, is proportional to:

$$\frac{2\pi r}{r^2} \times \text{strength of current}$$

$$\text{i.e. } F = \text{constant} \times \frac{2\pi}{r} i,$$

where i is the current in some unit.

Unit current is defined in terms of the magnetic effect (called the electro-magnetic unit, or E.M.U.) by saying that if it flowed in a circle of radius 1 cm. it would produce a magnetic field of 2π dynes per unit pole at the centre. This makes the constant equal to unity, and:

$$F = \frac{2\pi i}{r} \text{ where } i \text{ is in E.M.U.}$$

The E.M.U. and the Ampere

The theoretical unit is too large for many practical purposes, so the *ampere* is used; this is one-tenth part of the unit defined. Not only does this give a definition of a unit current but the same ideas underlie a practical method of measuring current in an instrument called a galvanometer, the principle of which is shown in Fig. 59. A coil of wire shown in section at A, A, and of a known number of turns, n, is placed in the magnetic meridian and at its centre a small magnet is pivoted. When a current is sent round the coils a magnetic field F is set up which is:

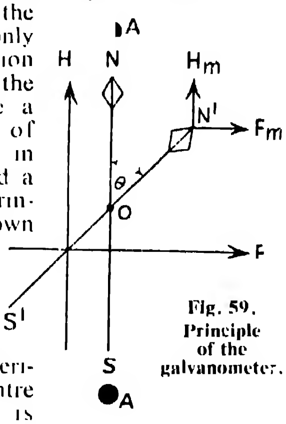


Fig. 59. Principle of the galvanometer.

$$\frac{2\pi i}{r}$$

this moves the needle through an angle θ, which is given by:

$$F = H \tan \theta \text{ (see page 643)},$$

$$\text{so that } \frac{2\pi ni}{r} = H \tan \theta$$

$$\text{or } i = \frac{Hr}{2\pi n} \tan \theta$$

If we know H and r, and observe θ we can calculate i in theoretical units, or, if we multiply by 10, we obtain i in amperes. This is the principle of the tangent galvanometer (or current measurer), and it is the fundamental idea in all galvanometers using a moving magnet. It is seen from this that if current is defined in terms of the magnetic effect it

produces, the current can be measured by similar means. The ammeter generally used for current measurement makes use of another principle, which is discussed later, but all moving magnet instruments are based on the foregoing theory.

Measuring Current

The unit of quantity of electricity in E.M.U. is obtained by considering the amount of electricity which is conveyed by the current in unit time. For example, if an ampere flows for one second the quantity of electricity passing any point is a *coulomb*, which is 1/10 of the quantity conveyed past a point in one second when a theoretical unit of current flows.

The current flows because a potential difference exists. From a theoretical point of view unit potential difference is defined as being set up between two points when 1 erg of work is done by the current in taking one unit of quantity of electricity from the point at higher to the point at lower potential.

This is much too small a unit for practical purposes, so a suitable number of these units are selected and called a practical unit—just as in measurement of length 1 inch is a suitable unit for some measurements, whereas for long distances 63,360 of these are taken and called a mile. The practical unit of potential is called the *volt*, and this is 100 million (10^8) theoretical units.

The Volt and the Ohm

It was found by Ohm that if a wire is maintained at constant temperature there is a constant relation between the potential applied to its ends and the current which results. Thus if i is the current and E is the potential:

$$\frac{E}{i} = \text{constant}.$$

This constant was called the resistance, R, and the relation above, which is called Ohm's Law, may be written:

$$\frac{E}{i} = R.$$

If E and i are in theoretical units, R is also in theoretical E.M.U. of resistance. This unit has many advantages in calculations, as have i and E, but for practical purposes it is much too small; a convenient large number of these units, 1,000 million (10^9), called the *ohm*, is used instead. In terms of practical units where i is in amperes, and E is in volts[1]

$$R = E/i.$$

In practical work usually written $R = E/I$

Thus if the mains are at 100 volts and a current of 5 amperes passes through an apparatus its resistance is:

$$\frac{100}{5} = 20 \text{ ohms}.$$

Actually, the resistance of a wire is not constant but in most cases goes up with an increase of temperature, so that if the resistance at 0° C. is R_0 and at t° C. is R_t, there is a relation connecting the two of the form:

$$R_t = R_0(1 + \alpha t + \beta t^2);$$

for small ranges of temperature this becomes:

$$R_t = R_0(1 + \alpha t)$$

because the constant β is small. The constant α for pure metals has a value of about ·0036. The change in resistance of a wire which has been measured at three known temperatures and thereby standardised can be used to measure unknown temperatures.

This is used in, for example, the measurement of furnace temperatures. The wire is encased in a porcelain cover and inserted in the furnace. The measurement of resistance can be carried out, through as long a circuit as necessary, in a cool office some distance away, using a modified form of Wheatstone bridge.

The Wheatstone bridge is a simple enough scheme. Two fixed resistances P and Q (usually equal, or P is 10 or 100 times Q) are connected as shown in Fig. 60. R is a known resistance which may be varied, S is the unknown. A battery sends a current via ABC and ADC, and R is adjusted until the galvanometer G shows no deflection, when it can be simply shown that the following relation holds:

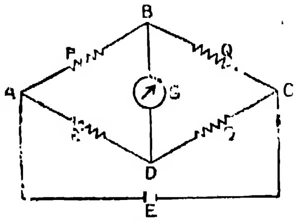


Fig. 60. Scheme of the Wheatstone bridge; lettering is explained in the text.

$$\frac{P}{Q} = \frac{R}{S},$$

from which the unknown S may be calculated.

LESSON 15

Effects of Electric Energy

When a current flows between two points where a unit of potential difference exists, the work done on each unit of quantity of electricity passing is, by definition, equal to one erg. The quantity, q, of electricity is given by I t where I is the current and t the time in seconds for which it flows.

Therefore the work done by the current when flowing between two points where the potential difference is E is q E or I t E ergs. This work is

done in overcoming the resistance, etc., in the wire and the energy appears as heat in the wire unless some definite extra work is done by the current.

Thermal Equivalent of Work

In Lesson 5 it was seen that as a result of Dr Joule's experiments one is able to find the thermal equivalent of the work W done, using the mechanical equivalent of heat J ($= 4{\cdot}2 \times 10^7$ ergs per calorie). It is therefore anticipated that an amount of heat H cals. is given when the current I flows for a time t between two points at potential difference E, where :

$$J = \frac{W}{H} \text{ or } H = \frac{EIt}{4{\cdot}2 \times 10^7} \text{ cals}$$

When the electrical quantities are measured in practical units we remember the relations given in Lesson 14, and it is then said that for I in amperes we have I/10 theoretical units ; for E volts, 10^8 theoretical units, and therefore :

$$EIt = E \times 10^8 \times \frac{I}{10} \times t \text{ ergs}$$

$$\text{or } = \underset{\text{amps}}{I} \times \underset{\text{volts}}{E} \times \underset{\text{secs}}{t} \times 10^7 \text{ ergs, i.e. the heat is } \frac{I \times E \times t}{4{\cdot}2} \text{ cals}$$

We see the energy supplied *per second* in amps × volts × 10^7 ergs, or *amps* × *volts* joules (since the joule is the large unit of work which is equal to 10^7 ergs). The *rate* of working in the electric circuit is E × I joules per second

Ohm's Law in Practice

In the C.G.S. system there is a unit for measuring the rate of working, just as in the British System there is the unit *horse power*. When the energy is used at the rate of 1 joule per second it is said that the rate of working is one watt ; therefore in our case the rate of working is volts × amps = watts. When the energy consumed is at a large rate, comparable with a horse power, a larger unit is used—1,000 watts—called a *kilowatt*. The rate of working in kilowatts is :

$$\frac{\text{volts} \times \text{amps}}{1000} = \text{kilowatts}$$

The ordinary electric lamp is rated at so many watts. A 60-watt lamp on a 100-volt mains passes a current, I, given by $100 \times I = 60$ or $I = 0{\cdot}6$ ampere. On a 240-volt main a lamp made for *this* voltage, and called a 60-watt lamp, takes I′, where :

$$240 \times I' = 60 \quad I' = \tfrac{1}{4} = {\cdot}25 \text{ amp}$$

In the first example of 100-volt mains the resistance of the lamp is given by Ohm's Law :

$$R = \frac{E}{I} = \frac{100}{{\cdot}6} = 166\tfrac{2}{3} \text{ ohms}$$

In the second example (240 volt) :

$$R = \frac{E'}{I'} = \frac{240}{{\cdot}25} = 960 \text{ ohms.}$$

If the lamp marked 60 watt 100 volt was put on the 240 volt mains the current which would pass would be, by Ohm's Law :

$$I = \frac{E}{R} = \frac{240}{166\tfrac{2}{3}} = 1{\cdot}44 \text{ amperes.}$$

assuming there is no change in the resistance of the lamp. It is important to avoid this in practice. In all electrical apparatus the voltage of the mains must be that marked on the apparatus.

Consider the second example a little further. The lamp wrongly used on 240-volt mains has a current 1·44 amperes. In proper use it should take ·6 ampere. The heat produced in normal running on its correct voltage is :

$$\frac{{\cdot}6 \times 100}{4{\cdot}2} \text{ cals. per second}$$

and the heat in the second example is

$$\frac{1{\cdot}44 \times 240}{4{\cdot}2} \text{ cals., i.e. } \frac{345}{60} = 5{\cdot}7 \text{ times as much}$$

The obvious will happen—the heat developed is nearly 6 times the normal, so the metal wire will melt and the lamp becomes useless. This kind of thing happens when a wire is overloaded. In wiring a house the electrician uses wires which are sufficiently thick, and therefore sufficiently low in resistance. He ensures that when the full load is taken the heating of the house wires will be negligibly small, as it would not be safe to allow encased wires to heat up. Sometimes the consumer adds electric irons and other devices and overloads the circuit.

The Domestic Fuse

To safeguard the house against possible fire, *fuses* are placed in each circuit. At the point near the meter where the wires are branching off to subsidiary circuits a box contains these fuses. They are simply lengths of wire made of tin/lead alloys, which join the outgoing and ingoing wires. When the current in any of the circuits exceeds the safe current in that circuit, the fuse becomes so hot that it melts.

A 5-amp. fuse melts when 5 amperes are passed continuously through it, so if the wiring is safe up to 5 amperes and a 5-amp. fuse is in circuit any increased load would break the weakest link—the fuse—and prevent overheating of the rest of the circuit. If the fuse " blows " it is easily replaced by first switching off the main switch and then inserting a new length of fuse wire of the same kind.

Measuring Electric Supply

The method of charging for electrical supply is to charge for the *energy* " consumed," as the supply is ultimately from energy used at the power station. If it is used at the rate of 1 kilowatt for one hour, energy equivalent to $(1000 \times 10^7) \times 60 \times 60$ ergs is used. This method of calculating the ergs introduces too many noughts ; it is put, simply, as 1 kilowatt hour, the Board of Trade unit of supply.

Suppose four 60-watt lamps are used for four

hours per night for one week, the energy in kilowatt hours is :

$$\frac{4 \quad 60 \quad 4 \quad 7}{1000}$$

In addition, one electric fire rated at 1 kilowatt (a 1-bar fire) for the same time consumes 1 4 7 28 kilowatt hours, and the bill at 3d per unit is :

$$(6{\cdot}72 \quad 28) \quad 3 \text{ pence}$$

$$\frac{34{\cdot}72 \quad 3}{12} \text{ shillings } \frac{104{\cdot}2}{12}$$

8s 8d , of which 7s is for the fire

The foregoing are referred to as the Joule heating effects. The expression for the energy, EIt, can be changed, by Ohm's Law, substituting IR, to I^2Rt, and the engineer usually refers to energy " lost " in this way as " the I^2Rt loss "

The Left-hand Rule

When a current passes along a wire there are other ways in which the energy may be practically used. If a straight wire AB, Fig. 61,

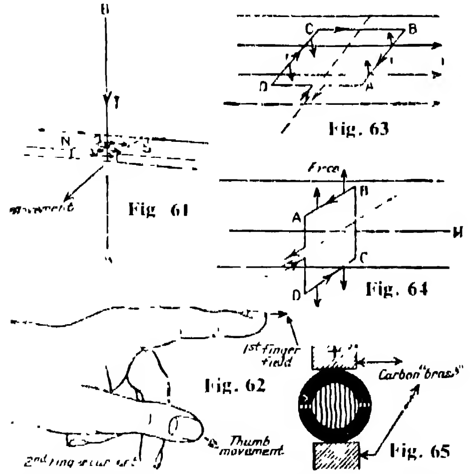


Fig. 61. Movement of an electric wire in a magnetic field. Fig. 62. The left-hand rule (see text). Figs. 63 and 64. The behaviour of a coil of wire relative to magnetic forces. Fig. 65. Principle of commutator in electric motor by means of which current is reversed and continuous revolution of the armature maintained.

conveys a current I as shown, and is in a magnetic field set up, in this instance, by two magnets, it is found that the wire is acted upon by a force tending to move the wire in the direction of the arrow. If either I or the magnetic field is reversed, the direction of movement is reversed.

If you extend the first two fingers and thumb of the left hand so that they are mutually at right angles, and then point the first finger in the direction of the magnetic field and the second finger in the direction of the current, the direction of the thumb indicates the direction of the resulting motion of the conductor (Fig. 62). This *left-hand rule* summarises the results of observation on the interaction between magnetic field and current

The Electric Motor

The movement takes energy from the source of supply of the current in addition to the I^2Rt energy, which is a loss if the main object is to produce movement. From a simple observation of this kind the modern electric motor has been developed.

Consider one stage in this development. A rectangular coil of wire is mounted to rotate about a central axis, shown as a broken line in Fig 63, and a uniform magnetic field, H, is applied at right angles to this axis The side AB is acted upon by an upward force, as may be seen by applying the left-hand rule, and the side DC is acted upon by an equal downward force This causes the coil to rotate.

When, as in Fig. 64, the coil is at right angles to the field, the forces are parallel to the plane of the coil and do not tend to turn the system. Actually, when the coil turns it overshoots this position, but the upward force on AB rotates it back to the position shown in Fig. 64. If, however, the current is reversed as the coil passes the position of Fig. 64, the coil rotates a further half turn, thus giving one complete revolution. If this reversal is done each time the plane of the coil is at right angles to the field, the rotation becomes continuous

This reversal is brought about by the use of a *commutator*, seen in Fig. 65, which shows the section of the axis. Two metal sectors, shown in black, are joined to the ends of the coil, and the current is led away via the carbon brushes. When the coil is in the " dead centre " position of Fig. 64, the gaps between the metal sectors are against the brushes, and a slight continued movement reverses the current automatically. So much for the physics of the motor. Development of this idea is the province of the electrical engineer

Galvanometers and Voltmeters

If a coil of wire is hung up by means of a very thin wire between the poles of a magnet as in Fig. 66, it is found that when a current is passed the coil moves through an angle and so twists the wire XY which supports it. When the wire is twisted it sets up a turning effect, tending to restore the coil to its original position.

If a coil with a soft iron cylindrical core (c) is fixed between the hollowed-out poles of a magnet (N.S.) it is found that the angle of twist is proportional to the current (Fig. 67). This constitutes a simple galvanometer with a moving coil, where I is proportional to θ, the angle of deflection, and it forms the basis of ammeters and voltmeters. Instead of the sup-

porting wires XY and the flexible lead Z, the coil is mounted on two jewels and the current is led in and out by two hair springs which also act as control.

When used as an ammeter, the two ends of the hair springs are connected to a low resistance (called a shunt) which allows most of the current to be side-tracked and which makes the net resistance of the instrument very small. The instrument is then placed in series with the circuit in which the current is to be measured. A pointer A gives a direct reading on a scale graduated in amperes.

When used as a voltmeter a very high resistance is placed in series with the coil, so that the total resistance of the whole instrument becomes so high that only a small current is passed through it: therefore the instrument is always used in parallel with the circuit in which the potential is to be measured. These points are illustrated in Fig. 68, which incidentally shows a ready way of measuring a resistance AB. If the voltmeter reads 15 volts and the ammeter reads 1·5 amperes:

$$\text{Resistance AB} = \frac{15}{1 \cdot 5} = 10 \text{ ohms.}$$

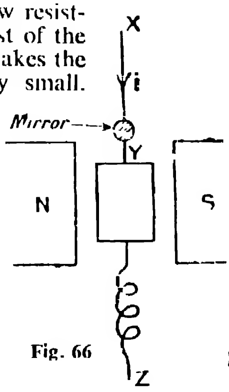


Fig. 66

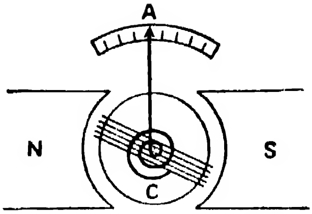


Fig. 67

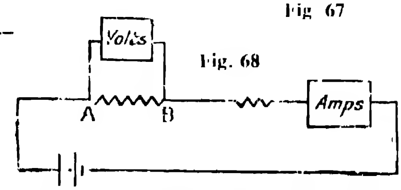


Fig. 68

GALVANOMETERS AND VOLTMETERS. Fig. 66. Diagram showing principle of mirror galvanometer. Fig. 67. Diagram of an ammeter or voltmeter. Fig. 68. Voltmeter in parallel and ammeter in series.

LESSON 16

Laws of Electro-Magnetic Induction

WHEN a coil of wire is joined to a sensitive galvanometer no current passes, as there is no source of potential. It was found by Faraday that if the magnetic field which passes through the coil is altered, current flows through the coil as shown by the deflection of the galvanometer.

Experiment shows that the current is produced when the field changes; it also shows that the quicker the change, the bigger the current will be.

It does not matter how the magnetic field is produced; so long as a change is made, a current will be set up in a closed circuit. If a few hundred turns of wire are wrapped around a cardboard tube and the ends of the wire are joined to a sensitive (moving coil) galvanometer, and then the north pole of a magnet is slowly introduced, a small deflection is produced in the galvanometer, which persists so long as the magnet moves in the same way. When the magnet goes out at the other end, the current reverses but is present so long as the magnet moves. If a magnet is introduced south pole first, the *direction* of the current is reversed but the current is there.

If the same two experiments are performed at a quicker rate the deflection is bigger, i.e. the current is bigger, but it lasts for the smaller time taken to move the magnet. This principle of inducing currents by means of moving magnets, or changing magnetic fields, is of immense importance, for it lies behind the whole field of application of electric energy.

Laws of Lenz and Faraday

If the direction of the current is found, it is seen that the induced currents set up a magnetic field in opposition to that which has caused them. For example, when the north pole is introduced, the current which is set up in the coil produces a magnetic field which tends to push the north pole out of the coil. When the north pole is taken out, the current reverses and so sets up a magnetic field tending to bring the north pole back again. This is summarised in the *Law of Lenz*, which says that

> when an induced current is produced it is in such a direction as to oppose the motion which causes it.

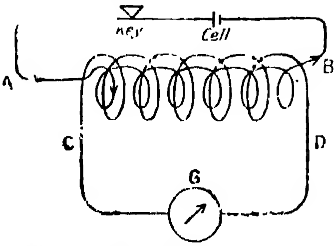
The first observations are summarised in Faraday's *Law of Electro-Magnetic Induction*, which states that

> an induced current is set up in a closed circuit whenever there is any change in the magnetic flux in that circuit. The induced electromotive force (potential) is proportional to the rate of change of the magnetic field (i.e. change per second).

These laws summarise the results of a very important set of experiments, and in them are found many useful applications of the principles

involved. So long as there is a change in the magnetic field threading through a circuit, an electric pressure (potential) is set up which will drive a current through a closed circuit (i.e. one in which there is a complete conducting path). It was seen that with a fixed coil this effect can be produced by bringing a magnet up to, and into, the coil. Another way is to have a second coil within the first, as in Fig. 69.

When a current is sent in coil AB, which is called the *primary coil*, a second current passes through the circuit CGD (which is called a *secondary coil*), containing a galvanometer G, which shows that the current passes only when the key in the primary circuit is being closed or opened. When the key remains down or up (i.e. when there is no change of primary current) there is no "secondary current."



ELECTRO MAGNETIC INDUCTION. Fig. 69. Current produced in secondary circuit.

When the current passes in AB it sets up a magnetic field in AB. If the corkscrew rule be applied to each turn of wire in the primary coil the field produced by all the turns is along the axis of the coil (called a *solenoid*). If the current is set up in the direction of the arrows, the magnetic field runs in the coil from left to right.

Therefore, as far as the secondary coil is concerned a magnetic field has been introduced in this direction, and therefore, to be consistent with Lenz's law, a current will be induced in the secondary in the opposite direction, in order to make a transient magnetic field to oppose the motion which causes the induction.

When the current in the primary coil is established, the magnetic field becomes fixed, and since there is now no movement of the field there is no induction and therefore the secondary current ceases. When the current in the primary is stopped, by opening the key, the magnetic field goes, and so again a transient current is induced in the secondary coil, this time in the reverse direction from the last.

In the secondary coil the electric pressure set up depends on the number of turns. Each turn has a definite pressure, so that the total potential at the ends of the secondary is proportional to the total number of turns in the secondary. In the device known as the *induction coil* a high potential can be produced by automatically or otherwise "making" and "breaking" the primary current.

For example, if 100 volts are used in the primary it is possible to obtain, with ease, 80,000 volts in the secondary. To do this large currents are used in the primary and only small currents are obtained in the secondary, because the power put in is never exceeded by the power taken out, i.e.

$$I_p E_p = I_s E_s$$

under ideal conditions, where I and E are the currents and potentials, and the suffix s refers to the secondary and suffix p to primary.

Suppose that, using 100 volts mains, the current that is taken is 15 amperes, and that 75,000 volts are produced in the secondary, then the maximum theoretical current (which is never quite obtained) in the secondary is:

$$I_s = \frac{100 \times 15}{75\,000} = \frac{1}{50} \text{ ampere}$$

These small currents are usually measured in a smaller unit called the milliampere (= 1/1000 amp.). Therefore the current is 20 milliamperes. This kind of device has been largely used in X-ray practice.

Theory of Generators

An alternative method of producing a current by relative movement of a magnetic field and a coil is to leave the field fixed and rotate the coil. Fig. 63 illustrates this. When the plane of the coil is at right angles to the field there is a maximum number of lines of magnetic force through the coil. When the latter turns through a right angle there are no lines of force through the coil. Therefore, in the act of turning, an electric current goes through the coil and the external wires which join its ends. Examine this case a little further with the help of Fig. 70.

Starting with the coil shown in section in Fig. 70 (a) with a maximum magnetic flux passing through it, we pass to Fig. 70 (b), where the position of the coil after moving through a right angle is set out. During this movement lines of magnetic force have been taken out of the left-hand face, and as the coil moves on to position (c) lines of magnetic force are pushed into the former right-hand face, which amounts to the same thing. Therefore a potential is set up always in one direction.

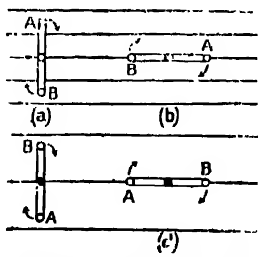


Fig. 70. Movement of coil in magnetic field produces current.

The rate of cutting the lines is very small in positions (a) and (c), but quick at position (b); therefore there is a big potential at (b), and there is no potential in the exact positions (a) and (c). As the coil continues to rotate for the next half revolution the potential reverses direction, for in going from (c) to (d) lines are now taken out of the face into which they were previously inserted.

It is seen therefore that this method of producing potential results in the direction being

reversed every half revolution, and if the ends of the coil are each connected to a separate circular ring (called a *slip ring*) on the axis of rotation a current may be caused to pass through an external circuit by allowing carbon brushes to press on these slip rings. If the ends of the coil are connected to a commutator (as in Fig. 65) the current in the circuit is reversed every half revolution and so becomes unidirectional.

The first type of current is called alternating current (A.C.), the second direct, or continuous, current (D.C., or C.C.), which has similar properties to that type of current already discussed. These are illustrated in Fig 71. A.C., which is

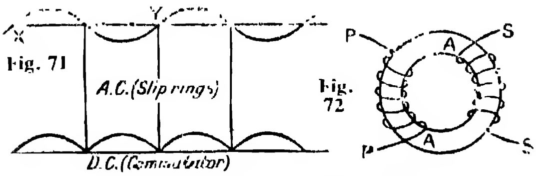


Fig. 71. Alternating and continuous current shown diagrammatically: X, Y is one cycle of A.C. **Fig. 72.** Simple transformer: A, soft iron; P, primary winding; S, secondary.

more generally supplied by the electric lighting undertakings, has certain advantages over D.C. It can be "transformed" from high to low potential, or vice versa, by using a *transformer*.

The transformer is a closed iron core on which are two windings of wire. When an alternating current enters PP (Fig. 72) it is continually changing direction In usual commercial supply there are 50 cycles per second This means the current goes first one way, then the other, completely 50 times per second, and so the magnetic field, set up in this core, performs similar reversals. This reversing field induces a potential in the secondary SS of the same frequency (i.e. 50/sec).

If the number of turns in SS is 20 times that in PP, the potential set up is about 20 times as big, and the transformer is said to be a "step-up" transformer. If the secondary has fewer turns than the primary, the potential is less (and therefore the current can be bigger) and the apparatus is called a "step-down" transformer. The student who wishes to follow this further should study wireless telephony, where understanding of these ideas is of fundamental importance (*see* the Course on RADIO AND TELEVISION).

Electrolysis

When a current passes through a liquid which conducts electricity, its passage is accompanied by a chemical decomposition of the liquid. This chemical effect is of importance to the chemist, who has been enabled to isolate substances by its aid. For an account of the process of electrolysis see the Course on CHEMISTRY.

Electricity is conveyed through liquid by means of *ions*, which are charged particles of matter. By the mere act of dissolving a salt in water the molecule breaks up into groups of atoms with equal positive and negative charges.

Thus a solution of common salt, NaCl—sodium chloride, contains molecules of NaCl together with positively charged sodium atoms called sodium ions, also negatively charged chlorine atoms called chlorine ions The number of molecules which dissociate or break up into ions depends on the concentration of the solution. The main point is that the solution contains the ready-made ions.

When two electrodes are inserted in the liquid and a potential difference is applied, the + ions are conveyed down the electric field and reach the −ive electrode, and the −ive ions move up the field and reach the +ive electrode. When they arrive at their destination they give up their charge to the electrodes.

The current therefore depends on the number of ions passing, on their velocity, and the charge on each ion. By finding the total mass of an ion deposited and the total quantity of electricity passed, the charge per ion (e) can be calculated, if the number of ions per gram is known. If the mass (m) of the ion is known the ratio of e/m can also be found By using solutions of metallic salts, *e.g.* copper sulphate and silver nitrate, the mass of the ions deposited, *i.e.* copper or silver, can be weighed, as they are insoluble.

When the charged ions reach the electrodes it sometimes happens, for gaseous ions, that they form layers on the electrode and, as they are charged, they set up a back electrical potential Thus, if E^1 is the value of this potential when a current I flows as a result of the application of a potential E, the resistance of the liquid, as stated by Ohm's Law, is not, as in current flow through metallic conductors:

$$\frac{E}{I} \text{ but } \frac{E - E^1}{I}.$$

Ohm's Law holds for liquid conductors as well as solids, provided the law is stated as:

$$\frac{\text{effective potential}}{\text{net current}} = \text{total resistance}$$

Resistance of Liquids

In finding the resistance of a liquid it is customary to use alternating current to overcome the electrode effect just referred to. The experiment is simply conducted using the arrangement of a Wheatstone bridge as seen in Fig. 60. Alternating current is used for current supply instead of the cell E, and a pair of telephones instead of the galvanometer. The adjustment of R is then made until the buzz in the telephone is reduced to a minimum when P/Q = R/S as before.

LESSON 17

Conduction in Gases: Ions, Electrons, and X-rays

If the two electrodes are removed from the electrolyte of a solution through which a current has been passing, and fixed—say, 1 cm. apart in air, it is found that no current passes. It is said that, for the potential applied, the air is an insulator or non-conductor. Similarly, if the electrodes are placed in pure water, no current passes. The introduction of some ions to the liquid is needed to allow the current to pass.

The question arises: Is it possible to introduce ions to the air in the space between a pair of metal plates to which a potential difference is applied?

Ions of positively and negatively charged *gas* molecules can be introduced and the air made conducting in that way. Consider the ordinary air between two metal plates A B (Fig 73). If we attach one cell and have a very sensitive recorder of current at Q, it is found that no current passes. By adding cell by cell we can build up quite a high potential and still find no current. It is clear that Ohm's Law is not obeyed in this case.

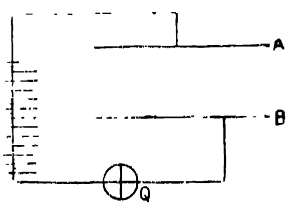


Fig. 73. Investigation of conductivity of gases.

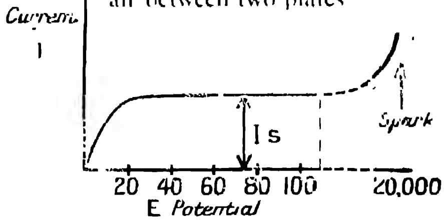
If we continue adding cells a potential is finally reached sufficiently high to break down the air resistance, and a spark passes. When the plates are replaced by two pointed rods the spark passes at much lower potentials. Once the spark has passed the air seems to act as though it were a conductor—a poor one, it is true. The air in the spark seems to have taken on conducting properties. It is in fact *ionised*, or split up into +ive and −ive molecules of air which convey the current.

If the potential is cut off and then after a short interval once more applied the spark appears to pass more easily, because some of the gaseous ions are present from the last spark. If a little time elapses before switching on the potential must be again raised to be as high as in the first case. The reason is that the ions have opposite charges, and being readily movable attract each other and recombine to be neutral air molecules.

It is seen from the foregoing that the formation of gaseous ions is possible by raising the potential to "sparking potential" for the gap. There are other means. For instance, if a beam of X-rays is sent through the gas, or the radiations from radioactive substances allowed to pass, the air is ionised so that even with a potential of only 2 volts a current will pass, so long as the ionising agent acts on the gas.

Both the ionising agents, X-ray and radioactive bodies, produce a definite number of ions per second, and when a potential sufficiently high is applied to the electrodes all the ions produced per second are carried across the space in that time and no more can be carried, i.e. the possible current will reach a maximum, and for any increase in potential there will be no increase in current simply because there are no more ions produced to be conveyed across the space. This maximum current is called the *saturation current.*

In Fig. 74 the relation between E and I shows that, except for small potentials, the Law of Ohm is again not applicable to conduction through gases. Incidentally, the "strength" of a beam of X-rays or the rays from a radioactive body is often compared by measuring the saturation currents which they produce in the air between two plates.



CONDUCTION IN GASES. Fig. 74. Graph of conductivity of ionised gases. Ohm's law does not hold here.

The effect of the applied potential is to direct the ions, the +ive ions to the −ive electrodes, and −ive ions to the +ive electrodes. As the potential is increased the speed of travel of the ions becomes greater, and when a sufficiently high potential is applied the ions attain such a speed that in their course between the plates they collide with other uncharged air molecules and ionise them.

This process is called *ionisation by collision.* The very large number of ions so formed repeat the process, and the result is that a very large current passes, again as a spark, between the plates.

When a gas at ordinary atmospheric pressure is considered, the conductivity is not in accordance with Ohm's Law. A very interesting and important sequence of observations may be obtained from a study of what happens to the conductivity of a gas when the pressure of the gas is reduced. Fig. 75 shows a section of a

glass apparatus which can be exhausted in slow degrees by connecting to an exhaust pump.

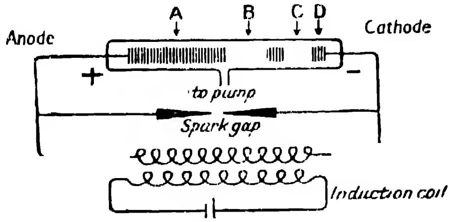
When ordinary atmospheric pressure prevails the discharge does not take place until the potential is raised to be sufficient to cause a spark to pass between the anode and cathode within the tube. (This may be as high as 30,000 volts for an inch space in air.) If there is an alternative spark gap as shown, the spark will all take place at this place, as there is a shorter air path in the gap.

When the pressure is reduced it is found that the spark ceases to pass at the spark gap, but at the same time there is evidence of a current passing through the tube in the form of a thin, line-like glow. As the pressure decreases there is a wide glow with a beautiful colour extending from the anode and almost reaching the cathode

This is called the positive column and it takes on a colour which is characteristic of the gas in the tube. With air it has a pinkish hue. As the pressure is decreased the colour scheme and the distribution of the glowing colours within the tube alter. A dark space is apparent between the cathode and the positive column, which now recedes towards the anode

Crookes' Dark Space

This is followed by the appearance of *Crookes' dark space*, and then a glow about the cathode, as indicated in Fig 75 For a further diminution



CATHODE RAYS. Fig. 75. A, glowing positive column; B, Faraday's dark space; C, Crookes' dark space, D, cathode glow.

of the pressure the resistance of the tube decreases, and the Crookes' dark space advances towards the cathode. Finally the Crookes' dark space fills the tube and the resistance gets bigger, as evidenced by the appearance of spark in the spark gap.

In the early stage the positive column and previous thin glow represent the actual path of the current. This glow can be deflected by using a magnet. But when the Crookes' dark space fills the tube there is naturally no glow to deflect. The glass walls of the tube at this stage take on a greenish glow. This represents a new phase in the gaseous discharge.

The electricity is conveyed through the tube by gaseous ions, which are made obvious in the early stages by the glow produced. In the later stages no glow is apparent to mark the ionisation, but the actual electric current is still conveyed by ions.

When the positive ions hit the cathode they give rise to what are called "cathode rays" or the "cathode stream." It is believed that they consist of negatively charged particles, called electrons, as will be seen in the following paragraphs

The Cathode Rays

In the experiment the cathode stream, on hitting the glass wall opposite the cathode, caused a vigorous green glow. When certain crystals were placed in the beam (which leaves the cathode at right angles and goes in straight lines) fluorescence was produced.

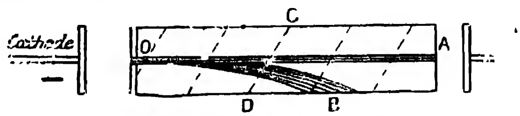
Certain sulphides glow when placed in such a beam These crystals, powdered and gummed to a sheet of cardboard, form an excellent screen for detecting the cathode ray beams. If a solid cross is placed between the cathode and such a screen placed within the tube it is found that a "shadow" is formed, just as if the fluorescence were caused by a light shining from the cathode, i.e the cathode rays travel in straight lines.

If the cathode is cup-shaped, the rays, leaving at right angles to the cathode, all converge to the centre of the cup. If a thin sheet of platinum is placed there, it is heated to a bright red glow by the bombardment of the cathode rays.

A light windmill placed on horizontal rails is caused to rotate by the cathode rays hitting the vanes. It is clear, therefore, that these rays are capable of showing their energy by the heat produced or, indirectly, by the rotation of the vanes

Effects of Magnetic Field

A most important piece of information may be obtained as to the nature of cathode rays by applying a magnetic field In Fig. 76 is a section of a suitable apparatus. A sheet of card covered with powdered zinc sulphide, CD, serves to indicate the path of the cathode rays which pass from the cathode through the slit O towards the anode, making a line of fluorescence OA. When the magnetic field is applied into, and at right angles to the plane of the paper the



CATHODE RAYS. Fig. 76. OA, path of rays when no magnetic field is acting; OB, path of rays with magnetic field acting at right-angles to the plane of this page.

line OA is displaced into the splayed out line OB. Applying the left-hand rule, it is seen that this is what would happen to a current going from A to O, and since the effect has its origin at O one is led to speculate that the cathode stream

is made of negative charges going from O to A. In other words, a wave theory for the beam appears to be wrong, and there are excellent grounds for supposing that the stream consists of negatively charged corpuscles

At this stage of exhaustion of the tube, therefore, one is led to visualise the current passing by means of ions, and where the positive ions bombard the cathode is a cathode stream of negative charges moving off at right angles to the cathode. These negative charges are additional to the negative ions which go from cathode to anode.

Theory of Electrons

Sir J. J. Thomson (1856 1940) was able to measure the speed of the cathode corpuscles and also to obtain a value of the ratio of the charge to the mass (e/m) The essence of his experiment was to deflect the corpuscles by a magnetic and an electric field. From the amounts of the deflections he calculated the quantities mentioned. From the found value of e/m and a knowledge of the probable value of e, it was calculated that m was approximately one two-thousandth part of the mass of a hydrogen atom.

The hydrogen atom is the smallest particle of matter which can exist alone, and the conclusion was reached that the corpuscles, which were called *electrons*, were a " fourth state " of matter —actually they were considered to be discrete particles of negative electricity free from all matter. They are, indeed, the "atoms of electricity."

Modern theory suggests that atoms are built up of a central core of positive electricity of a definite value with one or more of these electrons moving about it in orbits. The charge on the electron is taken as a fundamental unit and is usually written as e. Fig. 77 represents the hydrogen atom with a core of $+e$ and one electron moving about it. The possible orbits for the electron have been the subject of much theoretical speculation, and certain paths or orbits are regarded as being possible. In the case illustrated the attraction which would result would be :

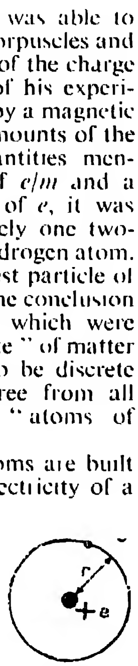


Fig. 77. Hydrogen Atom.

$$\frac{ee}{r^2} \text{ (according to the inverse square law).}$$

This is balanced by the effect of the rotation. When the electron jumps to an orbit nearer the core the potential energy is less, and the difference in these energies is regarded as being spent in radiation. The characteristic lines of the line spectrum of the elements are regarded as originating in this manner. The ionisation of the element is produced by the removal of the electron from the atom. From this brief statement of the theory of the atom it becomes clear that if the theory is at all correct the electron which was " isolated " by J. J. Thomson in the very artificial manner in the discharge tube should be available in all forms of matter, since it is the fundamental brick from which the matter is made. This conclusion has been verified.

Emission of Electrons

Electrons can be produced in a variety of ways, and from all forms of matter. When any matter is bombarded by X-rays or γ-rays from radioactive bodies, such matter becomes a source of electrons When ultra-violet light falls on polished zinc plates a copious supply of electrons is given out.

A method of obtaining electrons was discovered by O. W. Richardson (b. 1879). When a wire is raised to incandescence it emits an electron stream which is stronger the higher the temperature of the wire. This phenomenon was called " thermionic emission," and it has been used in the thermionic " valve " or vacuum tube, where it is noticed that the thermionic current, I, is bigger the higher the temperature, T, of the wire, which is controlled by the heating current or filament current In fact I, by Richardson's law, is equal to

$$AT^2e^{-\frac{b}{T}}, \text{ when } A \text{ and } b \text{ are constants.}$$

Discovery of X-Rays

Re-examining the discharge tube where the electron was first discovered, there is another property of the electron to discuss. When the electron is stopped by a platinum foil it was observed heat is produced. In addition to this a very small fraction of the energy of the electron stream is changed into a radiation which is called *X-rays*.

This was accidentally discovered by the German physicist Wilhelm Konrad Röntgen (1845-1923) when he was investigating the properties of the cathode ray stream. Röntgen had a discharge tube covered completely with black paper. Outside the tube was a screen covered with crystals of barium-platino-cyanide. When the potential was applied to the tube in a dark room it was found that the screen lit up, owing to a fluorescence of the crystals. When solid bodies were placed between the tube and the screen the shadows enabled him to locate the origin of the radiation.

This he traced to be the spot where the cathode rays were arrested. The energy of the cathode rays which were so changed was small, but the radiation was relatively penetrating. It was further found that the radiation passed through substances like flesh and tissue but was absorbed by bone. The denser and the higher the atomic weight of a substance the more it absorbed the rays. When a hand was placed

between the tube and the screen the latter showed faint outlines of the fingers, each framing a shadow picture of the bones.

The medical application of the discovery was very soon realized, and many used it for the location of foreign bodies e.g. a needle in the hand—and for the diagnosis of fractures, and so on. The physicists developed a special tube for the more efficient production of the rays.

The Coolidge Tube

About 1914 a new type of tube, called the Coolidge tube, was introduced ; it has now mostly replaced the ordinary gas tube which was then in use. The new ideas involved aim at complete control of the radiations given out, both as to penetrating power and strength or intensity of the beam.

These ideas may be readily understood on reconsidering the glass vessel (Fig 75) ; it is found that when the tube is exhausted of the gas beyond the stage when the cathode rays appear, the more the gas is exhausted the bigger the resistance becomes. The current is conveyed by ions ; when an ion travels down the tube it hits the gas molecules and produces more ions by the collisions As the pressure gets less, the number of the gas molecules gets less, and so the farther any molecule or ion can go without hitting another molecule or ion.

When the pressure is so low that an ion can go from one electrode to another without hitting a molecule (that is, when the mean free path is longer than the distance between the electrodes) it goes from one end of the tube to the other without producing more ions.

Instead of the thousands of ions normally produced only one goes through the tube. The current is therefore reduced to practically zero value and the resistance of the tube becomes enormous. This is the state inside the Coolidge tube shown in Fig. 78. Even when very high potentials are applied no current passes ; and as there is no appreciable number of ions passing there are no electrons produced and consequently no X-rays.

To produce the necessary electron stream the cathode used is a spiral of wire which can be made incandescent by a heating current, just as in the modern thermionic valve. To make the electrons so produced go down the tube at a high speed and set up X-rays when stopped at the anti-cathode, a potential is applied from an induction coil or a large step-up transformer. By making the potential high, penetrating X-rays are produced ; by making the filament current high, an intense beam is produced.

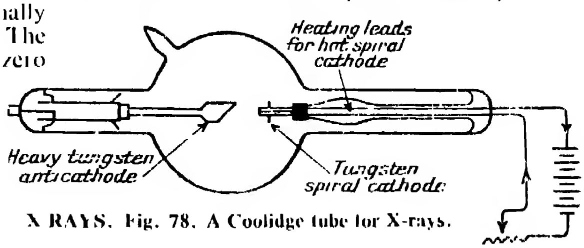
X-rays are not electrically charged particles, since they are not deflected by a magnetic field Because of the great penetrating power of the "hard" rays and because they cannot be deflected, or reflected or refracted, they must be of a wave-length much shorter than any ultra-violet ray. In Angstrom units they have an average wave-length of 1 compared with 2,000 for very short ultra-violet light.

The use of X-rays in medicine includes the diagnosing of fractures of the bones, whose shadow picture can be produced on a screen. A permanent record can be made by substituting a photographic plate for the fluorescent screen.

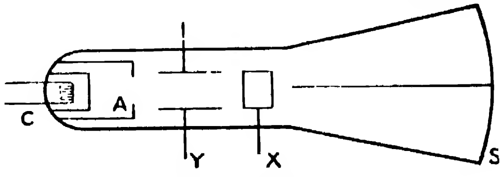
For example, when X-rays are used to help in diagnosis in the alimentary tract the patient is given a heavy barium salt, which fills the stomach, etc., and allows the radiologist to determine, both from the shape and the time the meal remains, whether or not the patient is normal . without the meal nothing could be gained in the case quoted. In addition to the more obvious medical applications, X-rays have been of extreme importance in helping the physicist to obtain information about the structure of the atom.

The Cathode Ray Tube

The cathode ray tube or oscillograph (Fig. 79) is of great importance in the field of television, radar, and laboratory research. An evacuated tube contains a heated cathode C and an anode A which has a small hole in it to allow a stream of electrons to pass through it and impinge upon a fluorescent screen S, where it produces a spot of light. The beam passes between two sets of plates in the horizontal and vertical planes. By applying a current to these plates an electric field is produced and it deflects the beam in the case of the Y plates vertically and of



X RAYS. Fig. 78. A Coolidge tube for X-rays.



CATHODE RAYS. Fig. 79. Cathode ray tube or oscillograph.

the X plates horizontally ; by this means the spot of light can be made to move anywhere on the screen. This instrument, having no moving parts, has a very quick response and is now used instead of the moving coil galvanometer previously described.

LESSON 18

Outline of the Quantum Theory

PRODUCED in a manner described in the preceding Lesson, X-rays have been most fruitful of results in investigations on atomic structure. When the rays were first discovered, the theories as to their nature also led to much physical research, which yielded results of importance.

In the early years of the 20th century the speculations on the nature of X-rays were very similar to those which were advanced in Newton's time to account for the nature of ordinary light. In those years two serious theories were rivals. The first postulated that light was produced by "corpuscles" shot out from the source and travelling in straight lines at great speed to the receiver, in much the same way as bullets from a machine-gun. A light source, on this theory, was analogous to a machine-gun nest firing its "corpuscle" bullets in all directions. This led to results which were contrary to experimental findings, and was abandoned. The other theory, which has held the field from that time until recently without serious challenge, is that light is a wave motion. This theory has been discussed in previous Lessons.

X-Rays and the Wave Theory

Many X-ray properties were such that support was apparently given in turn to each theory. Reflection, refraction, interference, diffraction, etc., which are to be predicted on a wave theory, and occur with light, were not found with X-rays, and so some support was forthcoming for a corpuscular theory.

When we discussed diffraction of light it was seen that the amount of diffraction to be expected depended on the relative size of the wave and the slit used. Also in such a simple thing as reflection the *regular* reflection of the wave occurs only if the surface is free of irregularities of the size of the wave.

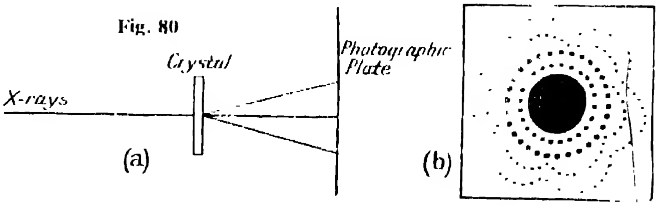
A sheet of white paper does not reflect light in the same way as a mirror, for the surface is not smooth to the order of a wave-length of the light used. It merely gives a diffuse reflection in most directions. This was the kind of result obtained in early experiments with X-rays.

Ultra-short Waves

A theory which was new about 1908, called the Quantum theory, led to the suggestion that X-rays were waves of a *very* short wave-length -- something of the order of one hundred millionth part of a centimetre (10^{-8} cm.). This is of the same order as the distance between the molecules in a solid.

It was then suggested that in crystals the molecules are arranged in regular patterns as evidenced by the constant shape of crystals of all sizes, and that if crystals were used some sort of diffraction or interference should be made apparent. The experiments performed to check this theoretical pointer were successful.

Fig. 80



X RAYS. Fig. 80. Experiment to determine nature of wave-length of the rays.

The scheme of the first experiment is shown at (a) in Fig. 80. A narrow beam of X-rays was sent at right-angles to a thin piece of crystal, and a photographic plate, arranged as in the diagram, was found to have a pattern on it when developed, showing a symmetrical set of images about the central area which marked the direct beam, as in (b). This pattern was produced by the diffraction of the X-rays at the regularly arranged molecules within the crystal.

The idea was developed by Sir W. H. Bragg (1862-1942) and his son Sir W. L. Bragg (born 1890), it was found that the equivalent of reflection could be obtained. Further, they were able to calculate the distance between the molecules and also the wave-length of the rays used. This settled the point, in outline at least, X-rays are of a wave character of measurable wave-length.

X-Rays and Light Rays

They are $\frac{1}{10000}$ part of the wave-length of visible light, but are of the same general nature as light—a very dwarf member of the family of radiations previously discussed. Incidentally, the crystal methods have led to a very certain way of investigating the arrangement of molecules and atoms within crystals and powders.

As technique has advanced it has been found possible to produce reflection at polished metal surfaces and also to produce refraction by thin prisms which in the early days was not obtainable. Incidentally again, the consequences of such refraction show that a beam of X-rays is bent in the opposite way from light, i.e. towards the refracting angle of the prism. The refraction

is small, but measurable. Diffraction by diffraction gratings has also been obtained, and it is safe to say that in nature these rays are very similar to the waves of light.

Photo Electrons

Light falling on certain metals causes emission of electrons from the metal. If an electric field is set up by arranging a positive charge near the metal, these electrons are attracted to the charge and consequently a current passes. Electrons ejected as a result of the action of light are called *photo electrons*.

The photo-electric cell, which now has a wide application, is based on this principle. The current passing fluctuates with fluctuation of intensity of the light falling on the metals.

In this respect, too, X-rays strongly resemble visible light. If a beam of X-rays falls on any substance it ejects electrons from that substance. By analogy with the photo electrons with light, these ejected electrons are called X-ray photo electrons. When X-rays are used the speed of the photo electrons is much greater than when they are excited by visible or ultra-violet light, and when hard X-rays (i.e. short wave-length X-rays) are used the velocity is greater than for soft X-rays (longer wave-length X-rays). These photo electrons cause ionisation in gases, which in the case of X-rays is almost entirely due to such secondary action.

The result of investigations on the velocity of photo electrons for different wave-length X-rays led to similar conclusions as in the case of visible radiations. A beam of one wave-length gives out electrons at one speed. Whatever the strength of the X-ray beam the speed of the electron is the same so long as the wave-length is the same.

The classical, established theory would not predict this sort of result. If, for example, one thinks of the electron as being ejected by the incoming wave one would expect that the stronger the beam was, the bigger the force and the quicker the speed of ejection would be.

Planck's Quantum Theory

About 1908 the German physicist Max Planck (1858-1947) propounded the Quantum theory. The theory as developed from Planck's first observations has many widely differing aspects and covers much scientific ground. Since he first propounded it, it has invaded almost every branch of physics until it has become the most important and dominating of all physical theories. It is not too much to say that the Quantum theory created a radically new outlook on the physical world.

Planck propounded the theory in order to explain the results of observations on the radiation of energy from a hot body. Here there was the first serious example of results obtained with radiation which did not agree with deductions based on the established or classical ideas.

According to these ideas, if a body is giving out radiations—and in so doing is really converting its energy into radiation—it may do so in a continuous manner. In the same way it presupposes that an atom may absorb energy continuously.

But this apparently obvious assumption leads to results contrary to experience. Planck postulated that when there is an interchange of energy from matter to radiation or vice versa, this interchange takes place in multiples of a unit of energy and that the size of the unit is different for each wave-length in the radiation. He did not use *wave-length*, however, but *frequency*. These are *simply* related, for:

$$\text{frequency} = \frac{\text{velocity}}{\text{wave-length}}$$

The Quantum of Energy

The unit of energy used in these interchanges was called the quantum of energy, for the particular frequency used. It is really equivalent to saying that when a radiation is falling on a body the latter is not taking in the radiation continuously but in small packets, or quanta; for a fixed frequency the number of quanta received per second depends on the intensity of strength of the beam.

The size of the quantum for any frequency n was postulated to be a constant $h \times n$, i.e. hn. This constant is called *Planck's constant* and is very small. Dealing with a large-scale effect removed from critical regions it is found that, since the quantum is small, the effect is similar to the classical ideas: but when one considers *individual atoms* absorbing energy there is a sharp demarcation in the results of the application of two theories.

In X-ray photo-electricity, for example, where we are ejecting single electrons by absorbing energy incident on a material, it is found by Planck's Quantum theory that if the X-rays have a frequency n, the unit of energy absorbed is $hn = W$, say, and this energy is given to the electron which is emitted. The kinetic energy acquired, $\frac{1}{2}mv^2$, is therefore given by:

$$W = hn = \tfrac{1}{2}mv^2 \quad \text{(i)}$$

Thus we have a relation between frequency n, and v, the velocity of the electron, assuming that all the energy is used to impart movement to it.

By measuring v for X-ray photo electrons an estimate of n and consequently wave-length of X-rays was made before crystal analysis was first introduced.

Application to X-Rays

Applying this theory to the X-ray case in all stages, it is found that the photo electron emitted has the same velocity as the electron in the X-ray tube. Suppose that the velocity of the electron

in the cathode ray beam in the X-ray tube is v, then the energy of the electron is $\frac{1}{2}mv^2$.

If this changes to X-radiations, causing the formation of radiation of one quantum, it is anticipated that the ray will have a frequency n given by :

$$\frac{1}{2}mv^2 = hn \ldots \quad \text{(ii)}.$$

When this radiation ejects a photo electron from matter it causes the latter to move with a velocity given by :

$$hn = \frac{1}{2}mv'^2 \ldots \quad \text{(iii)}$$

therefore this velocity is the same as that of the parent cathode ray electron—a fact which had been shown experimentally to be the case before the Quantum theory was developed.

A Model of the Atom

The Rutherford-Bohr model of the atom considers it to be made up of a positive nucleus with electrons rotating about it in orbits. The higher the atomic weight, the larger is the number of electrons. When an electron from an outer orbit is removed—say, by being hit with another electron or by impact of a radiation—the atom which is left without one of its negative charges is ionised.

When an unattached electron is attracted to the incomplete atom it loses potential energy with respect to the positive nucleus or core. Suppose this energy lost as potential energy is W ; then according to the Quantum theory there will be radiated from the atom a radiation of frequency n given by $W = hn$, where again h is Planck's constant. Accordingly, if n comes to be within the limits of the visible spectrum the radiation will be light.

Formerly it was thought that the radius of the orbits of the electrons might have any value (considering circular orbits for simplicity) within the limits of the atom. But the Quantum theory postulates that only relatively few radii are permissible. The radii are of such magnitude that the energy of the electrons in these orbits is a simple multiple of a unit value. Therefore, when one considers the electrons in the atom one has only to visualise possible paths, which are relatively few.

Atomic Radiation Frequencies

Returning to the atom again : consider the removal of an electron from the orbit next to the outer one. It is found that the atom can be made complete once more, this time either by an electron from the outer orbit or alternatively from outside the atom. In each case there is a specific amount of energy lost as potential energy and, consequently, radiated out as a radiation of one or two frequencies given by the foregoing equation (i).

A set of radiations of definite frequencies will be radiated from the disturbed atom. For a different atom a similar set of frequencies will be possible, but of different absolute values—each atom can give out its own waves of frequencies, which can be calculated. If these frequencies come within the visible range they correspond to the line spectra discussed in Lesson 11.

When very fast electrons bombard the atoms it is possible to remove electrons from the orbit or near to the nucleus itself. These electrons move out as photo electrons. The incomplete atom which is left gets back to normal by the falling in of electrons from the outer orbits and finally from outside the atom itself.

In processes of this kind the energy change may be as much as 1,000 times that visualised above. Consequently, the frequency n of the radiation emitted is 1,000 times as great, or the wave-length 1,000 times smaller. It is no longer a light wave but an X-ray wave which is given out.

There are in the X-ray regions, as in the light regions, many possibilities of replacing the "lost" electron. Consequently there is radiated a range of wave-lengths, and X-ray spectra result. The most penetrating X-rays have their origin in the removal of an electron from the orbit nearest the nucleus, and the consequent completion of the atom by the falling in of an electron to that orbit.

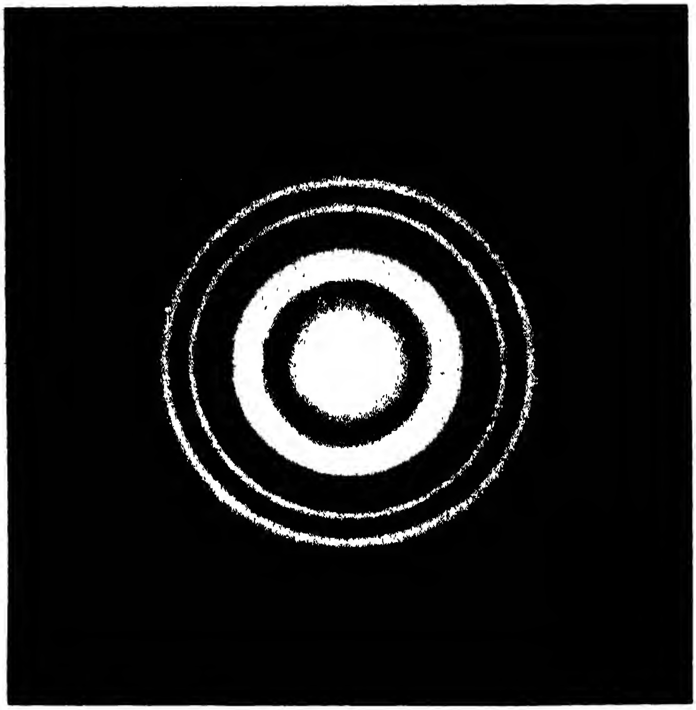
Atomic Disintegration

In Lesson 11 of the Course on Chemistry an account is given of the physics of radioactivity, and in Lessons 12 and 13 in the same Course are summaries of the theories of the atom, together with an account of the work of such physicists as Lord Rutherford. From these accounts it will be realized that in a radio-active disintegration of an atom it is possible to obtain α, β and γ "radiations." The α and β "rays" are not rays but are charged helium nuclei and electrons respectively. The γ radiation is a true radiation of the same nature as X-rays.

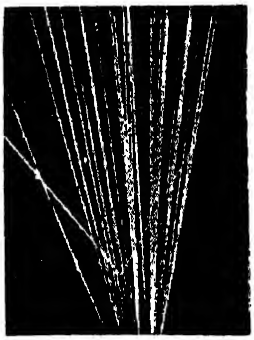
The chemical property of an atom depends among other factors on the number of positive charges on the nucleus. Therefore if this charge is altered, either by altering the weight of the atom or otherwise, the chemical nature of the residue will be changed.

When an α particle is removed there is a removal of a helium atom of atomic weight 4 and also a removal of two positive charges, so the net charge is two units less, and on both counts it is clear that the atom has been spontaneously transmuted to a lighter atom having entirely different properties.

When a β particle is shot out of the nucleus the effect is an in appreciable loss of mass—i.e. the atomic weight remains the same, but because there is a loss of one unit of negative charge the net positive charge left on the nucleus is one



Wave form of motion of electrons shown photographically



Alpha rays (helium atoms) made visible.

Photo by Dr. P. M. S. Blackett

BEHAVIOUR OF ELECTRONS. Although the electron theory treats of electrons as corpuscles or particles, the wave mechanics theory of Schroedinger treats the moving electron as waves. Experimental work shows that when passed through a thin film of gold (left) electrons behave as waves ; passed through a gas (below) they behave as particles.

Path of electrons photographed passing through a gas, in collision with particles of other matter, behaving as particles.

Photos by Prof. C. T. R. Wilson and Prof. G. P. Thomson. Cambridge University Press

more than before. It is an entirely different atom although it has the same atomic weight.

A study of the table of the radioactive series of uranium in the Chemistry course will make these points clear: the fact to notice here is that in these emissions of β particles in particular we have a phenomenon similar to the photo electron discussed. If the β particles are stopped they give rise to radiations according to the foregoing equation (i). These naturally occurring, quickly moving charges provide material for considering the application of relativity.

(For developments in splitting the atom *see* the Course on CHEMISTRY, Lesson 12.)

LESSON 19

The Theory of Relativity

THE so-called radiations from a radio-active body include, as was seen in the preceding Lesson, the β "radiation," which is a stream of very rapidly moving electrons which are ejected from the nucleus itself. According to the particular source of the β particles it is found that their velocity has distinct values, and these velocities, although very great, have been measured by deflecting the particles in strong magnetic fields.

From the deflection produced calculation has yielded the values of v. Combined with the magnetic deflection experiments the deflections produced by strong electric fields have given data from which the ratio of e/m (electronic charge to mass) has also been calculated for the electrons from different sources.

Electron Mass and Velocity

The velocities have been found to be very great indeed. For example, from Radium B velocities of 1 to 2 $\times$ 10^{10} cms per sec. have been allotted to the β particles. The interesting fact emerges that e/m has smaller values for the higher velocity β particles, and the student is led to one of two obvious alternatives to account for these results either the mass of the electron has a bigger value or the charge becomes less when the speed is increased.

Now e has been determined by a very large number of experiments and invariably its value comes to the same number. At the same time it is to be remembered that one of the fundamental concepts of the older mechanics is that mass is constant.

This latter notion is the basis of the older mechanics founded by Newton, and it has been adequate to account for all observed facts from his day to the 20th century. In 1905 Einstein first formulated his celebrated principle of relativity, and this provides an explanation of the variation of e/m with velocity

Systems of Reference

In dealing with movement it has to be realized that all measurements are of motion relative to some "system of reference." The speed of a car, e.g., is measured with respect to the ground, which may be taken as the "system of reference" in this case. In other words, measurements of the speed of a body on the earth are relative to the earth, which is itself moving.

It is said that a car is moving at 60 miles per hour, whereas, actually, it is moving 60 miles per hour only with respect to the earth. It is actually travelling at some great speed through space in addition to the 60 miles per hour developed by the engine. The expression for velocity is very dependent, therefore, on the exact way in which it is measured

As a further example, consider raindrops falling. If there is no wind they fall directly downwards. To a man stationary on the ground the drops are falling vertically with a definite speed. If the man runs in any direction the drops no longer appear to fall either vertically or with the same speed as before. Even when no wind is blowing the drops seem to be beating into his face (i.e. coming on the slant) with a greater velocity than before. If a wind is blowing a further complication ensues, for now the drops are in a medium which is itself moving.

To have some idea of the actual speed of the drops of rain in this case it is necessary to measure them with respect to a stationary observer (stationary, that is, compared with the earth), and then also to determine the movement of the air, or, what is the same thing, the velocity of the wind.

Actual and Relative Speed

If one were in a closed carriage of a railway train and the movement of the wheels could not be heard or felt, and if one had no means of measuring except in length and time, one should be able to find the velocity of a fly in the carriage, and this would be relative to the carriage itself. The train might travel with uniform velocity, or be retarded or accelerated, but as far as measurements go the velocity of the fly in this limited region would be the same if it continued its motion uniformly in the carriage.

Actually, the true velocity with respect to the earth would be variable and the variation would depend on the train's movement. Regarding the earth for the moment to be at rest, the only way to measure the fly's velocity is for the

observer to get outside the carriage and measure from the "stationary" earth

When it comes to the normal measurements, one is in precisely the same position as the observer in the closed carriage. The earth is moving as part of the solar system. Measurements of velocities can be made with respect to this system just as those in the carriage are made with respect to the carriage.

The *actual* velocity of movement of a particle in the solar system cannot be determined by measurements made within the system. We need outside, stationary reference points from which to measure and to decide whether we are moving with a uniform speed or not.

The Michelson-Morley Experiment

Attempts were made to reach such a method of measurement when it was assumed that the ether was the system of reference and the absolute value of a velocity was supposed to be that measured with respect to the ether. Light is propagated in the ether, and therefore if it travels with a constant speed the time it takes to pass from one point to another should depend on whether we travel with the light or against it—i.e. there should be a difference in the observed velocity as measured on the earth—it should apparently go quicker against the direction of movement of the earth than when moving with it.

An elaborate optical experiment was performed by the American physicists A. A. Michelson (1852–1931) and E. Morley (1838–1923) to test this point, and it was found that there was no observed difference. It appears that light travels in the ether just as though the earth were still. This experiment showed the impossibility of measuring or even detecting the earth's velocity with respect to the ether. Other experiments have demonstrated this failure.

This indicates the uselessness of the ether as a system of reference, and a theory was developed which omits any reference to it. It does not accept or deny the existence of the ether but merely does not refer to it. This theory is Einstein's Theory of Relativity.

Einstein's Theory

Einstein's method of procedure is far too complex to put into simple language, but by an application of a system of mathematics which appears to be very involved to the uninitiated he deduced many important consequences.

He showed that if measurements of length are made there is the equivalent of a contraction of the measuring rod in the direction of motion which does not occur when the measuring rod is at right angles to the movement. The velocity of light, according to the theory, is to be taken as the maximum speed attainable and it is regarded as constant. Another conclusion he arrived at is quite opposed at first sight to the accepted, classical mechanics of Newton, namely, that the mass of a body is not invariant—i.e. has not always the same value. It is to be noticed that although this statement appears to be in direct contradiction to the ideas which were taken as absolutely fundamental before 1905, in reality it becomes different from Newtonian mechanics only when one is dealing with masses moving with very great speeds—in fact, with speeds approaching what is regarded as the limiting value, that of the velocity of light.

In effect, Einstein says that if the mass of a body at rest is m_0 (and this was the invariable mass of that body in terms of Newtonian mechanics), the value of the mass, when moving with a velocity v, is m where:

$$m = \frac{m_0}{\sqrt{1 - \left(\frac{v}{c}\right)^2}} \qquad \text{(i)}$$

where c is the velocity of light.

The exact nature of this change of mass he showed to be equal to the gain of kinetic energy divided by c^2. When one remembers that $c = 3 \times 10^{10}$, i.e. thirty thousand million centimetres per second—one sees that $c^2 = 9 \times 10^{20}$ and realizes that a gain in kinetic energy, which is to be divided by this number, must be very great in order to produce an appreciable quotient. Ordinary masses moving at normal speeds have no measurable change in mass.

Referring to the foregoing equation (i), if it were possible for the moving body to have a velocity c equal to that of light, the mass, m, would become:

$$\frac{m_0}{\left(1 - \frac{c^2}{c^2}\right)^{\frac{1}{2}}} = \frac{m_0}{0} \qquad \text{(ii)}$$

The quotient obtained by dividing any finite number by 0 is infinitely large; that is, a body going with the velocity of light would acquire infinite mass.

Perhaps the student will appreciate the predictions of the theory of relativity in this respect much better by considering the values of the masses acquired for definite speeds. If a body has a mass of m_0 at rest, substitution in equation (i) shows that it will have the following values for the velocities quoted:

Velocity		Mass
0·5 c	= 1·5 × 10^{10} cm. per sec.	1·15 m_0
0·9 c	= 2·7 × 10^{10} „ „ „	2·3 m_0
0·99 c	= 2·97 × 10^{10} „ „ „	7·0 m_0

Imagine an aircraft flying at 480 miles per hour, or 704 ft. per sec., say 25,000 cm. per sec.; this is only a minute fraction of c of the order of ·0000008 c, so m would be

$$m = \frac{m_0}{\sqrt{1 - (\cdot 0000008)^2}} = m_0(1 + 3{\cdot}2 \times 10^{-13})$$

i.e. $m = 1{\cdot}00000000000032 \times m_0$

If the aircraft had a mass at rest of 50,000 kilogrammes (about 50 tons), the gain in mass would be only about 00000015 gm. or ·000000005 oz. Even at the speed of sound, approx. 330 metres per sec., the fraction of c is still only ·000001 c and the gain in mass infinitesimal.

Limits of Newtonian Mechanics

It seems almost an obvious comment that if this be so there is not much wrong with the Newtonian mechanics, which does not indulge in higher mathematics to show that the change in mass is of this extremely minute amount.

The Newtonian mechanics certainly is for all practical purposes correct when dealing with large scale phenomena of this kind, and it breaks down only when one considers such a case as the electrons in the β ray streams ejected by radioactive bodies. In this instance the correction for the variation in mass of the corpuscles gives a value of e/m which agrees with experiment and emphasises the constancy of e, the electronic charge.

The theory of relativity also offers an explanation of an outstanding discrepancy between theory and observed result in connexion with the planet Mercury. A minute yet observable difference in its path with time had long been a puzzle. The slight correction which the principle introduces clears up this point. Again, according to the principle of relativity there should be an interaction between radiation and a strong gravitational field. If light were a stream of particles, then one would expect that when the stream passed near a large body there would be an attraction, just as there is on a body near the earth.

Radiation and Gravitation

There is an equivalent effect, according to the theory of relativity, on ordinary waves such as light waves. Any radiation, in fact, has allotted to it its equivalent energy, and this allows calculations to be made of the effect of the pull of a heavenly body on a ray of light which happens to travel near it.

Expeditions which have set out to observe stars during a solar eclipse have aimed at finding out if such a pull is exerted by the "gravitational field" of the sun, for the change in direction of the rays of light should make the stars appear slightly out of place.

The position that stars should occupy during eclipse is calculated beforehand. Stars normally invisible as the line of sight is just grazing the sun are chosen. The exact position they appear to occupy is calculated from photographs, and there is some reason to believe that the shift predicted by the theory is measurable.

LESSON 20

Protons, Neutrons, and Wave Mechanics

The investigation of small-scale phenomena and the effect of great speed has led the physicist and the mathematical physicist to a collaboration that has yielded results which a few years ago would have seemed fantastic.

It has been shown from a consideration of the Quantum theory that when there is an interaction between radiation and matter, the former always deals in energy bundles, or quanta, of size hn where h is Planck's constant and n is the frequency of the radiation.

In fact, the quantum is often regarded in much the same way as Newton regarded his corpuscles in the celebrated corpuscular theory of light, and in this respect there is a reversion to this old theory.

Photons and Electrons

The beam of radiation (light and any other electro-magnetic wave) is regarded as conveying its energy in *photons*, each of which carries the quantum hn. The use of the word photon itself suggests a discrete corpuscle of the radiation, and the application of this idea has led to some developments. For example, the American physicist A. H. Compton (born 1892) made a theoretical investigation of what happens when a beam of X-rays falls on electrons. He assumed that the energy in the X-ray beam was conveyed by photons (quanta) which behaved as discrete corpuscles and hit an electron in such a way that one can make use of many of the laws of impact applicable when two billiard balls collide.

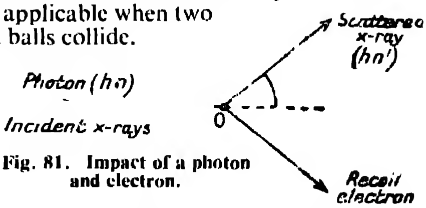


Fig. 81. Impact of a photon and electron.

Fig. 81 shows his method of treatment. An incident beam of X-rays enters from left to right and hits an electron at O. It is assumed that in the impact we are dealing with a photon of energy hn, and an electron. After impact the photon rebounds in one direction, as shown, having a new energy value hn' (i.e. as a quantum of another radiation which is less than hn because some energy has been imparted to the electron), and the electron recoils, as shown, in another direction.

Compton calculated the values of *hn'* and the velocity of the electron after impact by applying the principles of conservation of momentum *and of energy*. The interesting conclusions which were arrived at lead one to expect that after such a collision the radiation has a smaller frequency *n'* and that recoil electrons move in the space with a pre-determined value.

As the frequency of *n'* is less than *n*, the wave-length of the " scattered " X-ray will be larger than the incident beam. Not only was a lengthening of the wave-length predicted but also the amount of wave-length change was shown to depend on the actual angle at which it happened to be scattered.

Photographing Electric Tracks

All these conclusions were verified by experiment. With an X-ray spectrometer the wave-lengths of the scattered X-rays were measured for different angles of scattering, and the wave-length change was found almost exactly as theory predicted. Also, with a cloud condensation apparatus photographs of electron tracks showed the presence of short tracks which exactly fitted the anticipated recoil electrons.

In this instance there certainly seemed to be ample proof that the X-ray " waves " behaved as corpuscles, and there was support for the use of the term photon to describe the phenomenon. Since the same laws are applicable in the case of all the electro-magnetic radiations it seemed that many phenomena could be explained in terms of a common conception, that of a corpuscle.

This notion is not so useful in giving an explanation of such things as interference, diffraction, etc. There still remains this curious fact, that one set of properties of radiation can be best explained in terms of a wave theory, and another set of observed results can be better explained if the photon development of the Quantum theory is used as a theoretical background.

In almost all instances the wave theory gives the broad outline explanation and the Quantum theory developments give the detail and account for those observed results for which the wave theory has no explanation.

Protons

There are many corpuscles which, it would appear at first sight at least, are beyond doubt discrete particles and which do not develop from radiation ideas. Of these the first in this Course was the electron. This particular corpuscle was shown to be a negative charge of a mass so small, compared with the mass of the hydrogen atom, that it is said not to be associated with matter at all.

All the *positive* charges so far dealt with in this Course have been of a much more massive structure. The smallest positive charge is that on the nucleus of the hydrogen atom. This charge is associated with the mass of the hydrogen atom and is equal in size but opposite in sign to the charge on the electron.

It will be remembered that the hydrogen atom was considered to be a nucleus with one electron moving about it. For the heavier atoms there is a similar simplified picture. The heavier the atom the bigger the positive charge of the nucleus, and correspondingly bigger is the number of electrons rotating about that nucleus.

Since for the heavier atoms the nuclear charge is a whole number of times that of the hydrogen nucleus, it seems obvious why a theory has developed on the lines of assuming that a tentative unit of positive electricity is that associated with the matter forming the hydrogen nucleus.

The *proton*, as this unit is called, is then used in building up other atoms. For example, the atom of sodium is supposed to be made of a nucleus containing 11 protons and surrounded by 11 electrons.

Positive Electrons

Until the end of the year 1932 positive electricity had never been isolated in a state free from matter as had the negative charge. In the course of intensive researches one experiment in 1933 seemed to produce clear evidence that the *positive electron* was isolated. Cloud condensation experiments were performed and the tracks of electrons and other ionising agents, liberated by penetrating cosmic radiation, were photographed.

The action of magnetic fields causing the tracks to be bent was also investigated. In some of the photographs tracks were obtained which were bent in a direction opposite to that in which the electron tracks were bent. This showed that the track was produced by a positively charged particle

With a knowledge of the magnetic field it is a fairly simple matter to estimate the magnitude of the particle if its charge is known. The estimated mass of the newly discovered particle was much less than that of a proton, so that it could not be associated with matter (unless indeed the hydrogen atom is not the smallest portion of matter which can be isolated)

There seems to be little doubt that this experiment isolated the positive electron, although it made no *definite* measurements of the mass, etc., of it.

Neutrons

Another corpuscle is known to modern Physics under the name of *neutron*. This, as its name suggests, is neutral in charge. This uncharged corpuscle is released when certain substances are bombarded by α rays and swiftly-

moving protons. In the last few years the meson has been discovered in cosmic rays. This particle has a mass about 200 times greater than that of an electron and it can possess a positive or negative charge.

The number of different corpuscles which have been isolated has increased, and more and more phenomena receive an explanation in terms of them. Important work has been carried out both on the theoretical and experimental sides, which has had an effect just the reverse of that produced by the introduction of the photon. This work is classified under the title of the New Quantum Theory, one aspect being Wave Mechanics.

Wave Mechanics

The Austrian physicist Erwin Schroedinger (b. 1887), who was a pupil of Count de Broglie (b. 1875), advanced a mathematical idea that was first introduced by de Broglie, in which a study of a moving corpuscle led to a mathematical form to express its movement, which was similar in general appearance to that which describes waves travelling through space. A moving electron, for example, in this treatment is expressed by an equation which looks very similar to that of a wave.

The analogy led to the suggestion that, in effect, the moving electron might be similar to waves of suitable wave-length. This does not mean quite that the new wave mechanics suggests that one must substitute a wave for this accepted *corpuscle*, the electron; but it does suggest that in the close analogy which the mathematical development has deduced there is a chance that in some respects the electron should exhibit wave-like properties.

To use an imperfect analogy, if we have a quickly-moving ship steaming over the smooth surface of the sea, and we view this from an aeroplane well above the surface, we shall see a set of bow waves moving over the surface and the ship itself also moving over the surface. In this analogy the ship represents the electron and the waves correspond to the wavelike structure which the wave mechanics suggests.

For a corpuscle moving with a velocity v, the length of the associated wave form is deduced to be equal to h/mv, where h is Planck's constant and m the electron's mass.

Evidence of Electron Wave-lengths

Experiments have been performed to try to detect any effect of the waves, and it is a surprising fact that the results in most cases have been positive. A stream of electrons when sent at right angles to very thin sheets of metal instead of going through with a reduced intensity or reduced speed have been found to spread out into definite rings, in a way very similar to the X-ray waves on passing through a thin crystal (*see* diagram, Lesson 18). This may be due to the diffraction of the waves and is, in fact, in agreement with the diffraction expected with waves of wave-length $\lambda = h/mv$.

For quickly-moving electrons the calculated value of λ is of the same order as X-ray wave-lengths. Sir George Thomson (b. 1892) was the first to demonstrate the effect clearly.

Although the diffraction was that given for waves of X-ray wave-length the absorption of the electrons still continues to obey the laws of absorption for electrons, i.e. they are still very easily absorbed in thin sheets, whereas X-rays of the same wave-length are able to penetrate relatively thick slabs of the same substance.

Another set of experimental evidence of the wave nature to be associated with the moving particle was obtained by the production of diffraction with ruled diffraction gratings. Here, again, one experimenter found the diffractions to produce lines just as would be produced by waves of length $\lambda = h/mv$.

Although this has not been confirmed, there is striking evidence that there must be some wave-like property associated with the electron. Experiments have also been made with uncharged particles—as there is no need, according to the theory, for the particle to have a charge—and confirmation is again forthcoming to support the new theory.

Cosmic Radiation

Another subject of interest in modern Physics concerns the very penetrating radiation which is present when all known sources of radiation, e.g. radioactive bodies, etc., are excluded. This penetrating radiation, which is sometimes referred to as cosmic radiation, is present at great height above the earth's surface. At the moment the origin of the radiation is unknown.

BOOK LIST

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Radioactivity. *Studies in Radioactivity*, Sir W. Bragg (Macmillan); *Radioactivity and Radioactive Substances*, Chadwick (Pitman).

Relativity. *Three Men Discuss Relativity*, J. W. N. Sullivan (Collins); *A B C of Relativity*, Bertrand Russell (Kegan Paul).

Light, Heat, and Sound. *Heat and Light*, Sir R. T. Glazebrook (Cam. U. Press); *Treatise on Light*, R. A. Houston (Longman); *The World of Sound*, and *The Universe of Light*, Sir W. Bragg (Bell); *Acoustics*, Yarwood (Macmillan); *Light and Sound*, Nelkon (Heinemann).

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FRENCH

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HOW TO LEARN A LANGUAGE

15 LESSONS

FOR *the first time in a compendium of self-instruction the principal foreign languages, French, German, Italian, Portuguese, Spanish, and Russian, are here presented on a special system which greatly simplifies the task of acquiring a practical proficiency in their conversational, literary, and commercial use. By special arrangement with the Orthological Institute of Cambridge, and in collaboration with its editor Charles Duff, each of the six Courses named has been expressly prepared for* PRACTICAL KNOWLEDGE FOR ALL *from the respective handbooks and readers issued in pocket volumes for the Institute by Messrs. Nelson & Sons, Ltd., Edinburgh and London. The copyright of these Courses is strictly reserved by the Orthological Institute of Cambridge.*

How to Learn a Language

It is highly desirable, before beginning the study of a foreign language, to know the answers to the following three questions:

1. For what *purpose* is this language to be learnt ?
2. What *standard of knowledge* is to be aimed at ?
3. What is the best *method* to achieve the desired standard for the particular purpose ?

If the prospective linguist can make up his mind as to the answers to these questions it will save him or her infinite time and trouble. Here it is proposed to assist the learner in answering these very important questions, upon which all his studies and progress will depend.

For What Purpose ?

Experience shows that most people learn a foreign language for one of the following purposes.

(1) For a career, in which a knowledge of the language is desirable or essential.

(2) For a technical purpose, such as the ability to read works in that language -on science, engineering, or some branch of technology.

(3) To be able to read and enjoy foreign literature, or to listen to foreign radio.

(4) For purposes of travel -and this may be subdivided into two standards: (a) the ability to find one's way about with some ease, make purchases, read notices, order meals and, generally, get about without feeling too helpless, and (b) do all these things plus obtaining an insight into the mentality and outlook of the foreign people with whom one mixes.

All these purposes demand different standards of knowledge, so let the student think out what his aim is, and then set out to achieve the necessary standard. *Begin by having a definite aim.*

What Standard of Knowledge ?

Half the failures in language study result from inability to know for what purpose the language is being studied, or the standard of knowledge that is being aimed at. One can consider standards of knowledge under three heads, as follows.

Mastery. The ideal. It means the ability to do everything with the foreign language that can be done with one's own: speak with the utmost ease and fluency ; write any sort of letter ; read any sort of book ; play any sort of game ; engage in any trade or profession. Mastery of a foreign language is very rarely achieved and then generally when the person has had altogether exceptional opportunities—for example, has lived through childhood in the foreign country. While it is all to the good that one should aim at mastery as the ideal, it is as well to know that it demands years of effort. One can hope to master, to "dominate," *one* foreign language ; to master two is well-nigh impossible.

Workaday Knowledge. This implies the ability to engage in the ordinary conversations of everyday life ; the ability to read, without continual recourse to the dictionary, an ordinary newspaper or magazine, a not too difficult author, or the average letter. Any person of average intelligence who persists can reach this standard through the material presented in these Courses. Four months' consistent study of one hour daily (six months for Russian) should lay a very solid foundation for this aim.

Reading Knowledge. This is the minimum standard to be aimed at, and it is one which can be achieved in a matter of weeks by anybody of normal intelligence. These language Courses provide all the grammar that is ever likely to be required for it ; and all the word-material for a solid foundation of knowledge. In three to four months the standard of knowledge for reading can be achieved. It must be the *first aim.*

What Method ?

There are as many methods in existence as there are teachers and exponents of methods—some good, some bad, some indifferent—but the results of modern research show that in all these methods except one there is a vast potential for wasted effort. In the 1930s C. K. Ogden, of the Orthological Institute, Cambridge, blazed a new trail with his "Basic English," in which 850 words with a few simple rules of grammar can express almost any idea of which the human mind is capable. Great books have been translated into Basic English, and men so enlightened as George Bernard Shaw and H. G. Wells not only approved it but acclaimed it as an outstanding scientific achievement of the century. Basic English gave a pointer to the fact that the text books from which foreign languages are taught to English people are full of masses of quite unnecessary material, and that the minds of learners have been (and still are) filled with rules and words that may never be used in a lifetime. Investigation has proved that in each language there is a *basic vocabulary* and a *basic minimum of grammar* which, when mastered by the foreigner, will enable him to express the most frequently recurring ideas of life. With this basic knowledge he is rarely at a loss.

It is this basic minimum of grammar and vocabulary which is presented in these Courses.

This basic knowledge must be acquired, whatever the purpose may be, or whatever standard

is aimed at in studying a foreign language. It is the shortest cut of all to either a reading knowledge, a workaday knowledge, or mastery of any of these languages.

Not a rule, not a word, is presented in these pages that is not essential. The languages are stripped bare of all useless material, and the students who learn from these Courses may do so in the full assurance that they are not wasting a moment over useless material, and that, if they master what is presented here, they will be possessed of a wonderfully flexible instrument. So much for that part of method represented by the material to be mastered.

How to Learn

Having decided upon an aim and a standard, and being put in possession of the very best material for learning, one can next consider the problem of how to learn. Here again system and method always triumph over haphazard study, and one must try to follow some rules that have been well tested. First, think of how a child learns its mother tongue. How quickly it does it! Why not learn as a child learns? A little thought will show that this is impossible. A child has a biological, a natural, urge to learn all about the world into which it has plunged. And it has (in 99 per cent. of cases) the best of all teachers—a loving mother, who also has a very natural urge to teach her offspring as much as possible. Language is the key to all knowledge for the child, hence for the child language-learning is almost a full-time job. And it is undertaken in an entirely favourable environment, with all the promptings and help which environment can provide.

The adult wishing to learn a foreign language, especially while in his own country and not in the country where the language is spoken, has an entirely different and infinitely more difficult problem to solve. A teacher is not at his elbow all the time; the people around him do not speak the language he wishes to learn; and hearing and reading his own language all the time are powerful linguistic distractions which incessantly drive away the foreign language from his mind.

Ten Golden Rules

He must find ways and means of overcoming all these difficulties, and, without troubling with reasons or explanations, let him accept the following as golden advice resulting from very wide experience:

Fix upon a daily period for *concentrated* study: not less than half an hour nor more than one hour.

In that period, learn at least one rule of grammar and at least 10 new words; or, alternatively, go over what has been already studied and is not yet fixed in the memory.

Devote one period a week to revision.

Once every four weeks re-read all that has been done, from the very beginning.

Attach more importance to the memorizing of words than to grammar. Keep a notebook with all new words printed in block letters (capitals), and without their English equivalents, to compel the memory to work and bring to mind the meanings.

In the course of everyday life do little mental exercises in the foreign language. For example, when in a sitting room look around at the different objects and try to bring to mind the words for them. Say to yourself in the foreign language "What is this?" and answer "This is a table"; or, "What is that?" and answer "That is a chair"; or, "What colour is this?" and answer "It is blue." As time goes on, make questions and answers a little more difficult. For example: "What kind of chair is this?" and answer, "This is a very comfortable wooden chair with a yellow cushion, and is usually placed near the window." And so on. This teaches one to think in the language, without translating.

When the numbers have been learnt, do little sums in the foreign language. Two and two make four; six and six make twelve; three times three make nine. And so on.

When learning a new word, if possible bring to mind a picture of the object. Thus, when learning the word for pencil, form a mental picture of a pencil; or better still, have one and look at it while learning the word, when that can be done.

Learn words both ways. Thus, in French, *un livre*, a book. A book, *un livre*.

It is desirable in the first few weeks to write out the foreign text of the exercises, or of some of them, as this also helps to fix words and grammar in the mind. But after five or six weeks try to make the memory retain all the grammar and words in them, without having recourse to writing.

Make your language a hobby, something that is not a task but an interesting, intellectual game which, if you want to play it seriously, requires some effort and attention. You cannot learn to play cricket or tennis, bridge or chess, with anything but amateurish competence unless you take them fairly seriously, especially in the early stages, and, when possible, observe the results achieved by skilled exponents. This also applies to learning a foreign language.

The "Gift of Tongues"

You often hear that Mr. So-and-So has the "gift of tongues," and you may suspect that you have not. There is nothing mystical about those people for whom it is claimed that they have the "gift of tongues." Investigate, and you will invariably find that they have devoted considerable care and concentration to study while in the learning stage. They are probably no more intelligent than you.

Remember that the language you are learning is more than just a series of rules and lists of words; that it is a living instrument of human thought, the key to the psychology of a people, and a gateway to their literature. Knowing it, you can talk to the foreigner, read his newspapers and books, appreciate his theatre, listen to his radio—in fact, do everything you can do with your own language. Grammar and vocabulary are unavoidable "mechanics" of language—parts which, like those of a clock, will work when assembled correctly but which, separate and unassembled as one meets them

in the learning stage, may seem dull and uninteresting.

To learn a foreign language does not demand some curious kind of super-intelligence or gift. It does demand work, patience, and perseverance. If your language-study is treated in a friendly way, as a hobby, and not as some dry-as-dust drudgery, then the more interest you have in it the quicker you will progress. You can learn at *any* age ; men have learnt new languages at over seventy years of age so well as to be able to translate books from them Persist, persist, persist !

The First of All Rules

If the foregoing commonsense rules are observed, the student can hardly fail to make progress. There must be one rule overriding all others · **never let a day pass without doing something with the language--learning ten new words, one rule of grammar, reading or revision.** If, by some circumstance, a day has been missed, then devote double time to the language for two days following. The reason is that at all costs the mind and memory must be kept " in training " in the new and still strange medium, until they are fully accustomed to it.

Do you remember how Robinson Crusoe taught English to his man Friday ? If not, look it up. You will find that in a short time Friday was expressing himself (in bad English) and understanding. He got along and quite nicely. Now, take to heart the lesson of Crusoe and Friday, and make up your mind that it does not matter in the least whether or not you make mistakes in grammar, so long as you can express what you want to express. Few foreigners are likely to cut you dead just because you make mistakes of grammar ! They often make them themselves.

The Englishman as Linguist

The record of the Englishman is one of far too much self-consciousness and shyness, and the story has got about that he is a " bad linguist." Absolute nonsense. The Englishman is no worse and no better a linguist than anybody else, but he does tend to be too self-conscious. You must shed all that from the outset, and make up your mind that, however you do it, you are going to express yourself in the foreign tongue. Far better to be able to do what Friday did, than nothing at all. And, with a little patience and perseverance, the Friday stage will be passed. You must strive hard to get to the stage at which you can read the foreign language slowly and understand what is read. With practice, easy reading will come. And when you have reached the easy reading stage your worst obstacles are passed You have reached the stage of enjoyment and enter a vast new world.

Do not worry too much about accent, so long as you are understood. Time will correct it, if you just watch it. As soon as you can read with ease, begin to listen to radio in the foreign language. At first, you may not understand much. Again, perseverance and patience will win the day. Speaking follows, but only by practice, for preference with natives.

You may think from what has been said here that you face a difficult if not almost impossible task. Not at all. It seems difficult, because it has been analysed in some detail. All this analysis is merely intended to put you on what experience has shown to be the right track--right from the beginning, and therefore in the long run the easiest, the most rapid and most productive of good results With patience, it is possible to achieve a workaday knowledge of several foreign languages.

FRENCH

LESSON 1

Essentials and Pronunciation

This Course consists of fifteen lessons, each of which should take the learner who is without a teacher from one week to ten days, assuming that he devotes not less than half an hour daily to study. For self-tuition an hour daily is advisable ; but never less than half an hour. On this basis, the Course can be mastered in from four to six months. With a teacher, much more rapid progress can be expected. A teacher should be found to help with pronunciation in the first few lessons, for good French pronunciation cannot be learnt from any book. It can be acquired only by ear from French people.

The beginner must be warned of something which has been (and no doubt will always be) a very common experience among language students. From time to time he may develop impatience and dissatisfaction with the progress he is making. He " cannot see daylight " in what he is doing. But he must not be dismayed, for a language is like a clock, in that it will not " work " until the parts have been assembled--of course, in the case of a language, mentally assembled ; in other words, until he has mastered and memorised what is put before him in the course of his lessons.

Experienced teachers agree that when a

moment comes at which the student feels that he is " up against a brick wall," the best thing to do is to revise what has gone before, and temporarily, for a week or so, to abandon the desire to start a new lesson.

" Hasten slowly " is a very good principle in language learning ; and no day need be considered wasted if one rule and twenty new words have been learnt. It is most important to *learn something new every day*, or never to let a day pass without application to the language, even if it be only in revision. In the learning phase, a few days' slacking means that much will fade from memory and have to be begun almost afresh.

A notebook that can be carried in the pocket should be used from the beginning. Write down difficult rules and words and, in leisure moments, refer to them again and again. This is a golden rule one that should be taken to heart.

Reading French

One other word of advice is necessary. From the outset, aim first at *reading* French, especially if you have no teacher. Speaking and understanding follow rapidly when opportunities for them occur - and with radio there need be no lack of opportunities for listening to French. If the language as written or spoken can be understood, speaking is merely a matter of practice.

Once the student has progressed to the stage of reading a book in French -and it can undoubtedly be achieved by any persistent person of average intelligence the wonderful vista of French literature appears Then, all the humdrum work and drudgery are rewarded many times over. Contact will have been established with great minds ; the variety of French literature is infinite, and a wonderful culture is there to be explored.

Basic Requirements

This Course is essentially scientific, being based upon the latest advances in the selection and presentation of grammar and words that are absolutely essential, whatever the purpose may be for which the language is studied. Nothing that is given in these pages should be neglected, for it is the practical minimum required.

At the end of the Course some advice will be found for further study, and suggestions for reading. With very little extra reading and practice, the student who has mastered the lessons of this short Course will have reached matriculation standard, and need have no fear but that the knowledge acquired will be sufficient for all the purposes of everyday life.

Accents and Pronunciation

The letters of the alphabet are the same as in English.

There are **Three Accents** :

(´) the **acute**, (`) the **grave**, (^) the **circumflex**, which are placed over vowels (but not over capital letters) to distinguish sounds and meanings.

There is also (¨) the **diaeresis**, to show that two vowels coming together are pronounced separately (**Noël**, Christmas).

The **cedilla** (**ç**) is used when **c** must be pronounced **ss**, before **a**, **o**, **u**, as in **façade**. (The letter **c** is otherwise pronounced as **k** before these vowels.)

All words are *stressed* on the *last syllable*. (This is a most important rule.)

Vowels

The vowel sounds in French are pure. They are to be pronounced as indicated below (but see the warning Note at the end of this Lesson).

A like English **a** in father
E ,, ,, **e** in demolish ; it is *silent* at the end of a word.
I or **Y** ,, **ee**
O like ,, **o** in mote
U like Scotch **guid** it has no equivalent in English. Say " ee " with lips rounded and protruded.
OE, **EU** like **u** in burn
OU like **oo** in moot

Nasal vowels and **OE**, **EU**, **Â** are *long* when they are accented and followed by one consonant (or more)

All vowels are long if followed by final **-ve**, **-se**, **-ge**, **-ble**, **-re**. Vowels are short when followed (in the spelling) by a double consonant, or in an unaccented syllable.

ê is pronounced rather like
è ,, ,, **e** in **get**
é ,, ,, **i** in **fit**.

ai, **ay** and **ei** are pronounced like **è** long (where)
eau, **au** are pronounced like **o** (English oh, pure)
oi is pronounced like **wa** in **water** (**oiseau**, *bird*, is *wah-o*)

Other diphthongs follow the sounds of their simple vowels ; **huile**, *oil*, is pronounced almost like Scotch " weel."

Nasals

There are four simple nasal vowels, and they are shown in the spelling. When a vowel letter is followed, *in the same syllable*, by one **m** or **n**, e.g. **tant**, **en**, **emprunt**, the **n**'s and **m**'s are nasal vowels, but not in **ami** (which is **a-mi**) nor **comme** (not unlike English come).

a or **e** *followed by* **m** or **n** makes a nasal
i ,, **y** ,, ,, ,, ,,

The pronunciation of French nasals must be acquired from a native by careful imitation. They have not even approximate equivalents in English.

Consonants

Unless mentioned below, consonants are pronounced the same as in English. Note the following special pronunciations :

CH is like *sh* in English.

-ER and **-EZ** at the end of words are like **é**.

-TION is like English *see-on* (last syllable nasal).

-STION is like English *stee-on* (last syllable nasal).

J is like English **s** in *pleasure*.

G *before* **e** *and* **i** is like **J** above, otherwise as in English **go**.

H is *always silent*.

S between vowels is like English **z**.

-ILL, **-IL** like English -**y** in **Yes**, except in **ville**, **tranquille** and **mille**, where it rhymes with eel, veal, etc.

-Y- between vowels as -**y** in English **yes**

C *before* **e**, **i**, **y**, like **ss**.

like English **ss**.

GN is like *gn* in ***mignonette*** or *ni* in *onion*

GU is like **g** in **go**, **get**.

QU is like **k**

TH is like **t**.

R should be strongly sounded (*i.e.* vibrated as in Scotch " braw, bricht ").

-ISME is pronounced *-issme*

W is like English **v** (**wagon**, pronounced *vagon*, last syllable nasal)

-ENT in *third person plural* of verbs is *silent*

Liaison

A *Final Consonant* is generally silent in French, but it is pronounced and carried on as if it were part of the next word when this next word begins with a vowel or an **h** mute. To justify liaison or linking, there must be a logical connexion between the two words.

In liaison, **s**, **x**, **z** are pronounced like **z** : **p** is sounded only in **trop**.

There is *never* liaison with the word for *and*, **et**.

NOTE.—The English equivalents for pronunciation given above are **makeshifts**. Strictly, every letter in French and every combination of letters should be regarded as representing a sound or sounds quite distinct from any English sounds. Listen to French records, wireless broadcasts, and follow the speaker, mimicking exactly the pronunciation : this will give facility in making the sounds. Good French pronunciation can be learnt only by listening to native speakers.

EXERCISE

Now turn to the next Lesson and read to yourself slowly in accordance with the above rules the French words given, making certain that your pronunciation follows closely the rules given above

LESSON 2

The Definite and Indefinite Articles

In this Lesson are to be studied the definite and indefinite articles, their method of use and contractions ; also the few occasions when they are omitted in French and used in French though not in English. It is a rule that an article must precede every French noun despite a small number of exceptional cases.

The words **the** and **a** are called *articles*, the former the *definite*, the latter the *indefinite*, article.

The Definite Article

For *the*, the equivalents are :

LE before a masculine noun.
LA before a feminine noun
LES before all nouns in the plural.
LE and **LA** become **L'** before words beginning with a vowel or **h** mute. Examples .

le père, *father* **la mère**, *mother*
les pères et les mères, *fathers and mothers*
l'amour, *love* **l'hiver**, *winter*

Used with the prepositions **à** *to* and **de** *of*, the following contractions are made :

AU takes the place of **à le** (but use **à l'** before a vowel or **h** mute).
DU takes the place of **de le** (but **de l'** before a vowel or **h** mute).
AUX and **DES** are used always in the plural

NOTE. To express the *possessive case* : "*The friend's name*" becomes "*The name of the friend*" - **Le nom de l'ami**, etc.

Use the article to express *parts of the body* and for *faculties* : **J'ai levé la main**, *I raised* MY *hand*, etc. Also, before names of *countries* and *seasons*, but not after **en**, *in*.

DU, **DE L'**, **DE LA**, and **DES** are used to express *some*, and are repeated before each noun :
Avez-vous du pain, de l'eau et des pommes ?
Have you (some) bread, (some) water, and (some) apples ?
DE is used without the article when an adjective precedes the noun, or when it is part of *adverbs of quantity*, such as **trop de**, *too much*, **peu de**, *little* : **plein de**, *full of* **une foule de**, *a crowd of*.

Or in negative sentences. Examples :

Nous avons de bons amis. *We have good friends.*
Il fait trop de bruit. *He makes too much noise.*
Nous avons peu de vin. *We have little wine.*
Nous n'avons pas de vin. *We have no wine.*

Bien de, *much*, *many*, always takes the article : **Bien des choses**, *many things*, **Bien du mal**, *much evil*, *badness*. But **Beaucoup de**, with the same meaning, does not : **beaucoup de pain**, *much bread*.

Omit the Article before **cent**, *a hundred*, **mille**, *a thousand*, before names of towns and small islands, and before words preceded by **avec**, *with*, **de**, *made of*, **en**, *in*, and **par**, *by* :

cent francs, *a hundred francs*
avec plaisir, *with pleasure*
nous irons à Paris, *we shall go to Paris*
une chaise de bois, *a wooden chair*
en Angleterre, *in England*
par cœur, *by heart.*

The Indefinite Article

This is used as follows:

Un before masculine nouns : **un homme,** *a man.*
Une before a feminine noun : **une femme,** *a woman*
Plural des, *some* : **des hommes, des femmes,** *some men, some women.*

The indefinite article is omitted when stating a nationality, rank, profession, or calling:

I am a doctor. **Je suis médecin, docteur.**
He is an Italian. **Il est italien.**
He is a captain. **Il est capitaine.**

EXERCISE ON ARTICLES

L'**article précède** ***le*** **nom.**
The article precedes the noun.
Le **nord de** ***la*** **France est très plat.**
The North of France is very flat
Paris est ***la*** **capitale de** ***la*** **France.**
Paris is the capital of France
Demandez-***le*** ***au*** **(à : le) facteur ou** ***aux*** **(à : les) employés là-bas.**
Ask (it to the) postman or the officials over there
Donnez-moi ***du*** **(de : le) pain,** ***de l'*****eau,** ***de l'*****huile et** ***de la*** **crême, s'il vous plaît.**
Give me (some) bread, (some) water, (some) oil and (some) cream, please.
Il y a beaucoup ***de*** **monde sur** ***la*** **place.**
There are many people *in* the square.
Voici ***un*** **homme qui veut vous parler.**
Here is a man who wants to speak to you.
C'est ***un*** **film très joli ; c'est** ***une*** **pièce amusante. Ce sont** ***des*** **spectacles qu'il ne faut pas manquer.**
This is a very fine film ; it is an amusing play These are shows which you should not miss
L'honnête homme n'a qu'***une*** **parole.**
The honest man keeps his word.
Elle a acheté bien ***des*** **choses ce matin.**
She bought a lot of things this morning

Contractions of the Definite Article

La **France est limitée** ***au*** **nord par la Manche et**
France is bounded on the North by the Channel and
le Pas-de-Calais ; ***au*** **nord-est par la Belgique**
the Straits of Dover ; on the North-East by Belgium
et le Luxembourg ***à l'*****est par l'Allemagne et**
and Luxemburg , on the East by Germany and
la Suisse. ***Au*** **sud-est, la chaîne des Alpes**
Switzerland. In the South-East, the Alpine range
la sépare de l'Italie : ***au*** **sud, ses côtes sont**
separates her from Italy ; in the South, her shores are
baignées par la Méditerranée : les Pyrénées la
washed by the Mediterranean ; the Pyrenees then
séparent ensuite de l'Espagne. ***Au*** **sud-ouest et**
separate her from Spain On the South-West and
à l'**ouest, elle est limitée par l'Océan Atlantique.**
On the West she is bounded by the Atlantic Ocean.

Omission of the Article

Je crois que vous avez raison.
I think you're right
N'ayez pas peur.
Don't be afraid.
Nous irons en Angleterre par avion.
We'll go to England by plane.
Il travaille avec soin.
He works carefully
Je les ai vus par hasard.
I saw them by chance.
Marseille, grand port de France, est situé près des bouches du Rhône.
Marseilles, *a* great port of France, is situated near the delta of the Rhone
On vient de le nommer ambassadeur ***en*** **Espagne.**
He has just been appointed ambassador to Spain
Prenez garde de ne pas prendre froid.
Take care not to catch cold

Definite Article Not Used in English

Le **printemps et** ***l'*****été sont les saisons que je préfère.**
Spring and Summer are the seasons that I prefer
La **vertu sera récompensée ;** ***le*** **vice sera puni.**
Virtue shall be rewarded , vice shall be punished
L'**Angleterre et** ***la*** **France sont séparées par la Manche.**
England and France are separated by the Channel.
Le **Havre est le grand port de** ***la*** **Normandie.**
Havre is the great port of Normandy
Je vais le voir tous ***les*** **samedis.**
I go and see him every Saturday.
L'**Amiral Nelson fut le héros de Trafalgar.**
Admiral Nelson was the hero of Trafalgar
Cet artiste joue ***le*** **Bach à merveille.**
This artist plays Bach marvellously

General

Jean est le nom de mon ami.
John is my friend's name
Le livre de mon père est sur la table
My father's book is on the table
Il prend le train de Londres tous les matins.
He takes the London train every morning.
J'ai trop de pain, mais je voudrais encore de l'eau, s'il vous plaît.
I have too much bread, but I would like more water, please
Ne vous donnez pas tant de mal, je porterai cette lettre en revenant de mon bureau.
Don't take so much trouble, I will deliver this letter on my way back from the office.
M. (Monsieur) Dupont habite Lyon avec sa famille : sa femme, Mme (Madame) Dupont,
Mr D. lives in Lyons with his family : his wife, Mrs D ,
leurs enfants, ses sœurs, Mlles (Mesdemoiselles) Jeanne et Marie, et sa grand'mère, Mme Dupont-Villiers.
their children, his sisters, the Misses Jean and Mary D , and his grandmother, Mrs D -V
M. Dupont est comptable chez MM. A. et Cie, marchands de charbon en gros.
Mr D. is an accountant at Messrs A and Co., wholesale coal merchants.

LESSON 3

Genders and Numbers of Nouns

HERE are considered French nouns, their genders and numbers, with the rules for their proper use. Examples are given and the principal exceptions are noted.

A noun is a word used for naming some *person* or *thing.*

There are TWO GENDERS for French nouns : masculine and feminine.

And TWO NUMBERS : singular and plural.

Gender

There is only one rule of gender which may be said to be without exceptions: that the names of *men* and *male* animals are *masculine* and the names of *women* and *female animals* are *feminine*.

Examples

le père, *the father*	**le bélier**, *the ram*
la mère, *the mother*	**la brebis**, *the sheep (ewe)*
le roi, *the king*	**le chien**, *the dog*
la reine, *the queen*	**la chienne**, *the bitch*.

NOTE. This rule only applies where there are different words for each sex, otherwise, as in English, an animal is regarded arbitrarily as male or female

le rat, *the rat* (m. or f.)
la souris, *the mouse* (m. or f.)

Hints Worth Noting

Masculine are: Names of trees, shrubs, seasons, months, days, colours, metals
nouns ending with a consonant
nouns ending with any vowel except **-e mute**
nouns ending with **-ment, -age, -ège**
the decimal weights and measures
other parts of speech when used as nouns.

Feminine are: Most nouns ending in **-e mute**
nouns ending in **-té, -son, -ion**
names of moral qualities, sciences and arts
names of qualities or states ending in **-nce, -esse, -eur, -ade, -ude**. Exception: **le silence**, *silence*

Double Genders

un aide, *a helper*	**une aide**, *help*
un livre, *a book*	**une livre**, *a pound*
un poste, *a position*	**une poste**, *a post*[2]
un souris, *a smile*[1]	**une souris**, *a mouse*
un tour, *a turn*	**une tour**, *a tower*
un vapeur, *a steamer*	**la vapeur**, *steam*

[1]Rarely used. Say **un sourire**
[2]**bureau de poste**, *post office*.

The Plural of Nouns

The general rule is that the plural of all nouns is formed by adding -s to the singular: a "silent" s, sounded only in liaison.

Examples

Le baiser, *the kiss* **Les baisers**, *the kisses*

Exceptions

Nouns ending in -s, -x, -z do not change.
Nouns in -u add -x.
Nouns in **-ail, -al** change these endings into **-aux**.

Examples

le fils, *the son*	**le chapeau**, *the hat*
les fils, *the sons*	**les chapeaux**, *the hats*
la voix, *the voice*	**l'hôpital**, *the hospital*
les voix, *the voices*	**les hôpitaux**, *the hospitals*
le nez, *the nose*	**l'émail**, *enamel*
les nez, *the noses*	**les émaux**, *enamels*

And remember

le ciel, *the sky*	**les cieux**, *the heavens*
l'œil, *the eye*	**les yeux**, *the eyes*

monsieur[1], **MESsieurS**[2]
madame, **MESdameS**
mademoiselle, **MESdemoiselleS**

[1]Pronounce: Me(r)sye(r), [2]Mésye(r).

The Feminine of Nouns

The general rule is to form the feminine of a noun by adding **e**.

Exceptions

Nouns ending in **-eur** change this into **-euse**.
Nouns in **-teur** (and not derived from Present Participles) change this into **-trice**.
Nouns in **-x** change it to **-se**.
Nouns in **-f** change it to **-ve**.

Nouns in **-et, -en, -on, -ot**, double the last consonant and add **e**.

Examples

un ami, *a friend* (m.)
une amie, *a lady friend*
un chanteur, *a singer* (m.) from **chanter**
une chanteuse, *a singer* (f.)
un instituteur, *a teacher* (m.)
une institutrice, *a teacher* (f.)
le boiteux, *the lame man*
la boiteuse, *the lame woman*

un veuf, *a widower*	**un sot**, *a fool* (m.)
une veuve, *a widow*	**une sotte**, *a fool* (f.)

A list of essential nouns will be found in Lesson 4 and a beginning should now be made of memorising them. Learn *not fewer than ten daily*.

Note on Exercises. In all the exercises which follow, the student is advised first to work out in his mind the meaning of the French, covering the English text while so doing. When the French has become clear, he may then try to render the English into French. Once fully understood, the French must be read over again and again until it has been almost memorised. Words not in the lists are occasionally introduced and should be learnt.

EXERCISE

The Feminine of Nouns

Mon ami est chanteur à l'Opéra, et sa femme est *danseuse* dans le ballet.
My friend sings at the Opera, and his wife dances in the ballet.

Après la mort du Roi *sa veuve* se retira dans ses propriétés.
After the King's death his widow retired to her estates.

La famille Dupont se compose, comme nous l'avons vu, du père, de la mère, du fils et de la fille, de deux sœurs et de la grand'mère; quant à son grand-père, il était mort depuis trois ans.
The Dupont family is composed, as we have seen, of the father, the mother, the son and the daughter, two sisters and the grandmother; as to his grandfather, he had died three years ago.

Pierre et Hélène sont le cousin et la *cousine* des enfants Dupont.
Peter and Ellen are cousins of the Dupont children.

Cette femme est docteur en médecine, et sa sœur est professeur; toutes les deux collaborent à différents journaux, et sont de fort bons écrivains.
This lady is *a* doctor, and her sister is *a* teacher; both of them write in several papers, and are very good writers.
(This is an instance of masculine professions recently adopted by women, for which there is no feminine form, although a form "doctoresse" is beginning to make its way into French.)

Le fermier aime son chien, qui garde ses moutons ; la *fermière* aime sa *chatte*, qui garde la maison des souris et des rats.
The farmer loves his dog, which keeps watch over his sheep ; his wife loves her cat, which protects the house against mice and rats.

On dit que *la* reine Elizabeth était une *musicienne* de talent.
Queen Elizabeth was said to be a talented musician

Mme de Staël était *un auteur* célèbre par ses écrits politiques et littéraires.
Mme de Staël was an author famous both for her political and her literary works

Plural of Nouns

Sur la table il y a des *livres*, des *plumes*, des *journaux*
On the table there are books, pens, newspapers

Les *fermes* de Normandie sont très pittoresques ;
The farms of Normandy are very picturesque ;

elles ont des *toits* de paille, des fenêtres à volets de bois ;
they have thatched roofs, windows with wooden shutters ,

dans la cour des *pommiers* donnent de beaux *fruits* rouges ;
in the yard apple-trees yield beautiful red fruit ;

il y a aussi des *vaches*, des *chevaux*, des *moutons*, des *oiseaux* de basse-cour ;
there are also cows, horses, sheep, fowls (of the farm-yard) .

les fermes sont généralement entourées d'*arbres*, pour les protéger des *vents* d'ouest.
the farms are generally surrounded with trees, to protect them from the west winds

Le coiffeur dit : " Au premier de ces *messieurs* ! "
The hairdresser says . " Next gentleman, please ! "

Dans les trains express il y a souvent des *wagon-lits*.
In (the) express trains there are often sleeping-cars.

LESSON 4

The Essential Vocabulary of French

To express oneself for all practical purposes, fewer than 1,000 words which differ in French and English have to be memorised. In these lessons the vocabulary consists of 353 similar nouns and 427 dissimilar ; 126 similar adjectives and 120 dissimilar ; 156 verbs similar in the two languages and 174 dissimilar. To these are added 201 invariable words. This vocabulary, used in accordance with the grammar, will give a total working vocabulary of several thousand words.

Now, the 635 similar words can quickly be learnt ; the work of learning them is easy—a very slight obstacle.

The 721 words dissimilar in the two languages can be learnt it has been ascertained—at a minimum rate of 10-30 per hour. After a few hours' practice up to about 50 can be memorised in an hour by an average student. Thus, the working vocabulary (and a *good* one !) can be mastered, if need be, in a very short time. A vocabulary of essential words *well known* is much more than half the battle in learning any language.

Try to learn 20-30 words daily, but never fewer than ten.

Essential Nouns, or Names of Things

Section 1. Nouns which are alike or almost alike in French and English.

Section 2. Nouns which differ in the two languages.

Section 3. Days, months, seasons, and countries.

NOTE. Many thousands of nouns are the same in French and English, or almost identical in spelling. They can be recognized immediately in reading. But it is of the utmost importance that the French words which resemble the English for common objects and ideas should be on the tip of the tongue, and familiar to the ear. It is one thing to recognize **la bière** as the equivalent of BEER ; it is another thing to be able to think of **la bière** when "beer" has to be expressed or is offered.

Before proceeding to Section 2, the List of Nouns which are similar in form and usage should be mastered. Then Section 2 will be found to be easier.

An image or idea of the thing should be present in the mind as each word is being memorised. This not only makes the process of learning more interesting, and therefore easier, but it **accustoms the learner to think in French.**

Thus, when **la brique** is being memorised, you must see in imagination a brick. You must think of it as something not to be dropped. And so on through the lists.

Know all the words both ways : *un arbre*, a tree : a tree, *un arbre*. Know them by sight and by sound : and to pronounce without hesitation.

Section 1. NOUNS SIMILAR IN FORM OR USAGE IN FRENCH AND ENGLISH

MASCULINE

un acte, *an act*
un accord, *agreement*
l'air, *air*
l'ambassade, *embassy*
l'ambassadeur, *ambassador*

MASCULINE

l'amusement, *amusement*
un agrandissement, *increase*
un animal, *animal*
un art, *art*
un automobile, *motor car*

MASCULINE

l'automobilisme, *motoring*
un aide, *a helper* ; **aide-médecin**, *assistant doctor*
un arrêt, *arrest, stopping place*

MASCULINE

un accident, *accident*
un aérodrome, *aerodrome*
un autobus, *omnibus*
un avocat, *lawyer (barrister)*

Section 1. NOUNS SIMILAR IN FORM OR USAGE IN FRENCH AND ENGLISH *(continued)*

FEMININE

- l'**addition**, *addition, bill*
- une **adresse**, *address*
- l'**approbation**, *approval*
- l'**attention**, *attention*
- l'**autorité**, *authority*
- les **affaires**, *business*
- une **assurance**, *insurance*

MASCULINE

- le **bébé**, *baby*
- le **bœuf**, *beef, ox*
- le **bifteck**, *beefsteak*
- le **biscuit**, *biscuit*
- le **bateau**, *boat, vessel*
- le **bouton**, *button* also *pimple*)
- le **bureau**, *office*
- le **bâton**, *stick*
- les **bagages**, *luggage*

MASCULINE

- le **corps**, *body, corps*
- le **café**, *coffee, cafe*
- le **capitaine**, *captain*
- le **carburateur**, *carburettor*
- le **cas**, *case*
- le **chat**, *cat*
- le **chèque**, *cheque*
- le **commerce**, *commerce, business*
- le **confort**, *comfort*
- le **comité**, *committee*
- le **cri**, *cry, shout*
- le **contrôle**, *control, supervision*
- le **coton**, *cotton*
- le **crédit**, *credit*
- le **crime**, *crime*
- le **cigare**, *cigar*
- le **cercle**, *circle*
- le **col**, *collar*
- le **coussin**, *cushion*
- le **citron**, *lemon*
- le **cinéma**, *cinema*
- le **chauffeur**, *driver*
- le **courant**, *current*
- le **choc**, *shock*
- le **commencement**, *beginning*
- le **consul**, *consul*

MASCULINE

- le **dictionnaire**, *dictionary*
- le **danger**, *danger*
- le **départ**, *departure*
- le **degré**, *degree*
- le **dessin**, *design, drawing*
- le **désir**, *desire*
- le **développement**, *development, expansion*
- le **directeur**, *manager*
- le **dîner**, *dinner*
- le **domicile**, *home, domicile*
- le **dommage**, *injury, wrong* (also *pity*)
- le **doute**, *doubt*

MASCULINE

- un **édifice**, *edifice*
- un **essai**, *essay, trial*
- l'**équilibre**, *balance, equilibrium*
- un **effet**, *effect*
- un **exemple**, *example*

FEMININE

- une **aide**, *assistance, help*
- l'**attente**, *waiting (expectancy)*
- l'**arche**, *arch*
- une **armée**, *army*
- l'**arrivée**, *arrival*

FEMININE

- la **banque**, *bank*
- la **base**, *base, basis*
- la **bière**, *beer*
- la **bicyclette**, *bicycle*
- la **botte**, *boot*
- la **bouteille**, *bottle*
- la **brosse**, *brush*
- la **boule**, *ball*
- la **bande**, *band*
- la **branche**, *branch*
- la **brique**, *brick*

MASCULINE

- le **consulat**, *consulate*
- le **cousin**, *cousin*
- le **concert**, *concert*
- le **compartiment**, *compartment (of a train)*
- le **chef**, *chef, principal, head*

FEMININE

- la **cabine**, *cabin*
- la **conduite**, *conduct, behaviour*
- la **carte**, *card*
- la **cathédrale**, *cathedral*
- la **couleur**, *colour*
- la **compagnie**, *company*
- la **condition**, *condition*
- la **couverture**, *covering, blanket*
- la **chambre**, *room*
- la **conversation**, *conversation*
- la **chaîne**, *chain*
- la **cigarette**, *cigarette*
- la **corde**, *cord, string*
- la **chemise**, *shirt*
- la **classe**, *class*
- la **crème**, *cream*
- la **commande**, *order, request*

FEMININE

- la **discussion**, *discussion, argument*
- la **danse**, *dance*
- la **dette**, *debt*
- la **destruction**, *destruction*
- la **digestion**, *digestion*
- la **direction**, *direction*
- la **distance**, *distance*
- la **douleur**, *pain, grief*
- la **demande**, *demand, request*
- la **déclaration**, *declaration, statement*
- la **dame**, *lady*
- la **douzaine**, *dozen*

MASCULINE

- un **expert**, *expert*
- l'**effort**, *effort*
- un **emploi**, *employment, occupation*
- un **employé**, *clerk, employee*

MASCULINE

- un **étranger**, *stranger, foreigner*
- un **estomac**, *stomach*
- un **étudiant**, *student*

FEMININE

- une **éducation**, *education*
- une **erreur**, *error*

MASCULINE

- le **fonctionnaire**, *functionary, official*
- le **front**, *front, forehead*
- le **fruit**, *fruit*
- le **fracas**, *smash*

FEMININE

- la **famille**, *family*
- la **forêt**, *forest*

MASCULINE

- le **gouvernement**, *government*
- le **grain**, *grain*
- un **guide**, *guide* (*man* and *book*)
- le **garage**, *garage*
- le **gaz**, *gas*

MASCULINE

- le **hasard**, *hazard, chance*
- un **hôpital**, *hospital*
- un **hôtel**, *hotel, inn*

MASCULINE

- un **indicateur**, *railway timetable*
- un **insecte**, *insect*
- un **intérêt**, *interest*

MASCULINE

- le **juge**, *judge*
- le **journal**, *newspaper*
- le **jardin**, *garden*

MASCULINE

- le **liquide**, *liquid*
- le **litre**, *litre*

FEMININE

- la **lettre**, *letter*
- la **librairie**, *bookshop*

MASCULINE

- le **motif**, *motive, cause*
- le **marché**, *market*
- le **métal**, *metal*
- le **moteur**, *engine* (*of a car*, etc.)
- le **mécanicien**, *mechanic, engineer*
- le **marchand**, *tradesman*
- le **muscle**, *muscle*
- le **médecin**, *doctor*
- le **moment**, *moment*
- le **ministre**, *minister*
- le **mystère**, *mystery*

FEMININE

- la **mode**, *fashion*
- la **monnaie**, *small change*

FEMININE

- une **existence**, *existence*
- l'**érudition**, *learning*
- une **enveloppe**, *envelope*
- l'**essence**, *petrol*
- une **éponge**, *sponge*
- une **étude**, *study*
- une **école**, *school*

FEMININE

- la **ferme**, *farm*
- la **fiction**, *fiction*
- la **frontière**, *frontier*
- la **flamme**, *flame*
- la **figure**, *face, form*
- la **fleur**, *flower*
- la **force**, *force*
- la **forme**, *form*

FEMININE

- une **gelée**, *jelly*
- la **graine**, *seed*
- la **grandeur**, *size*
- la **gorge**, *throat*

FEMININE

- une **histoire**, *history, story*
- une **heure**, *hour, o'clock*

FEMININE

- une **idée**, *idea*
- une **industrie**, *industry*
- une **invention**, *invention*
- une **instigation**, *suggestion, instigation*
- l'**instruction**, *education*
- une **île**, *island*

MASCULINE

- le **kilomètre**, *kilometre*
- le **kilo**, *kilo, kilogramme*

FEMININE

- la **liaison**, *connexion, link, friendship*
- la **limite**, *limit*
- la **liste**, *list*
- la **lampe**, *lamp*
- la **légation**, *legation*

FEMININE

- la **maladie**, *illness*
- la **machine**, *engine, machine*
- la **marque**, *mark*
- la **mesure**, *measure*
- la **mémoire**, *memory*
- la **mine**, *mine* (also *face, countenance*)
- la **minute**, *minute*
- la **montagne**, *mountain*
- la **multiplication**, *multiplication*
- la **musique**, *music* (also *band*)
- la **matière**, *matter, substance*
- la **médecine**, *medicine*
- **Madame**, *Madam, Mrs*

Section 1. NOUNS SIMILAR IN FORM OR USAGE IN FRENCH AND ENGLISH (*continued*)

MASCULINE
le **nerf**, *nerve*
le **nom**, *name*
le **numéro**, *number* (in order)
le **nombre**, *number* (total)

MASCULINE
un **ordre**, *order*

FEMININE
une **odeur**, *smell*
une **offense**, *offence*
une **observation**, *observation*

MASCULINE
le **projet**, *project, plan*
le **propriétaire**, *proprietor, owner*
le **papier**, *paper*
le **payement**, *payment*
le **point**, *point* (also *full stop*)
le **poison**, *poison*
le **porteur**, *porter*
le **produit**, *product*
le **profit**, *profit*
le **parent**, *relation* (plural) *parents*
le **penchant**, *slope, inclination, tendency*
le **pot**, *pot*
le **pantalon**, *trousers*
le **public**, *public*
le **passeport**, *passport*
le **plateau**, *plateau, tray*
le **palais**, *palace*
le **prêtre**, *priest*
le **président**, *president*
le **port**, *port, harbour*
le **plan**, *plan* (also *map of a town*)
le **paquet**, *parcel*
le **pneu** (*pneumatic*) *tyre*

MASCULINE
le **quai**, *quay, railway platform*

FEMININE
la **nation**, *nation*
la **nécessité**, *necessity*
la **note**, *note*

FEMININE
une **offre**, *offer*
une **opération**, *operation*
une **opinion**, *opinion*
une **organisation**, *organization*
une **orange**, *orange*

FEMININE
la **propriété**, *property*
la **page**, *page*
la **partie**, *section*
la **pâte**, *paste, dough*
la **personne**, *person*
la **place**, *place, seat, square (in a town)*
la **plante**, *plant*
la **pointe**, *point (sharp end)*
la **police**, *police*
la **position**, *position*
la **prose**, *prose*
la **proportion**, *rate, proportion*
la **promenade**, *promenade, walk*
la **punition**, *punishment*
la **parole**, *word*
la **plume**, *feather, pen*
la **pipe**, *pipe*
la **poche**, *pocket*
la **pompe**, *pump*
la **planche**, *plank*
la **pharmacie**, *chemist's shop*
la **poste**, *post*
la **profession**, *profession*
la **paire**, *pair*
la **part**, *part*
la **photo**, *photograph*
la **prison**, *prison*

FEMININE
la **qualité**, *quality*
la **question**, *question*
la **queue**, *queue, tail*

MASCULINE
le **règlement**, *regulation, adjustment*
le **rond**, *round*
le **regard**, *regard, look*
le **repas**, *meal*
le **regret**, *regret*
le **représentant**, *representative*
le **repos**, *repose, rest*
le **rythme**, *rhythm*
le **rat**, *rat*
le **reçu**, *receipt*
le **radio**, *wireless, radio*

MASCULINE
le **sac**, *bag*
le **sentiment**, *feeling*
le **silence**, *silence*
le **soldat**, *soldier*
le **secrétaire**, *secretary*
le **sens**, *sense*
le **serpent**, *snake*
le **service**, *service*

MASCULINE
le **tribunal**, *law court*
le **tarif**, *scale*
le **théâtre**, *theatre, stage*
le **transport**, *transport*
le **tableau**, *picture*
le **train**, *train*
le **thé**, *tea*

MASCULINE
l'**usage**, *use, usage*

MASCULINE
le **voyage**, *voyage*
le **vapeur**, *steamer*
le **vers**, *verse*
le **village**, *village*

MASCULINE
le **wagon**, *carriage, car*

MASCULINE
le **zéro**, *zero, nought*
le **zèle**, *zeal*

MASCULINE
le **restaurant**, *restaurant*
le **rapport**, *report, record*

FEMININE
la **règle**, *rule*
la **répartition**, *distribution*
la **réaction**, *reaction*
la **raison**, *reason, right*
la **religion**, *religion*
la **rivière**, *river*
la **route**, *road, route*
la **république**, *republic*
la **rime**, *rhyme*

FEMININE
la **science**, *science*
la **société**, *society*
la **soupe**, *soup*
la **scène**, *scene*
la **surface**, *surface*
la **serviette**, *serviette, towel*

MASCULINE
le **télégramme**, *telegram*
le **téléphone**, *telephone*
le **tabac**, *tobacco*

FEMININE
la **théorie**, *theory*
la **table**, *table*

FEMININE
une **unité**, *unit, unity*
une **université**, *university*

FEMININE
la **vapeur**, *steam*
la **valeur**, *value*
la **vibration**, *vibration*
la **vue**, *view*

FEMININE
la **zone**, *zone*

Section 2. NOUNS WHICH DIFFER IN THE TWO LANGUAGES

MASCULINE
un **avion**, *aeroplane*
un **appareil**, *apparatus, machine*
un **ami**, *friend*
un **an**, *year*
l'**ascenseur**, *lift, elevator*
un **amour**, *love*
l'**argent**, *silver, money* (**La monnaie** is *small change*)
l'**agent de police**, *policeman*
l'**acier**, *steel*
un **appui**, *support*
un **arbre** *a tree*
un **anneau**, *ring*

MASCULINE
le **banc**, *bench, form, seat*
le **beurre**, *butter*
le **bouchon**, *cork* ; (le **tire-bouchon**, *corkscrew*)

MASCULINE
un **après-midi**, *afternoon*
un **accroissement**, *growth, enlargement, accretion*

FEMININE
une **abeille**, *bee*
une **aiguille**, *needle*
une **assiette**, *plate*
une **araignée**, *spider*
une **aile**, *wing*
l'**actualité**, *the present*
une **allumette**, *match* (to light)
une **année**, *year* (*duration*)

MASCULINE
le **bain**, *bath*
le **baiser**, *kiss*
le **brouillard**, *mist*
le **besoin**, *need*

MASCULINE
le **bruit**, *noise*
le **billet**, *ticket*
le **billet de banque**, *banknote*
le **but**, *end, goal, aim*
le **bouillon**, *broth*
le **bois**, *wood*
le **bas**, *stocking*
le **bras**, *the arm*

MASCULINE
le **compte**, *account*
le **coup**, *blow, stroke*
le **coup de pied**, *kick*
le **cuivre**, *copper*
le **cuivre jaune**, *brass*
le **chou**, *cabbage*

FEMININE
la **bougie**, *candle*
la **brume**, *fog*
la **bonne**, *housemaid*
la **baie**, *berry*
une **bibliothèque**, *library*
la **boite**, *box*
la **bouche**, *mouth*
une **bouchée**, *mouthful*
la **bêche**, *spade*
la **boutique**, *shop* (*small*)
la **brûlure**, *burn*
la **boisson**, *drink*

MASCULINE
le **charbon**, *coal*
le **concours**, *competition* (for a prize)
le **camion**, *motor lorry*
le **cuisinier**, *cook*
le **champ**, *field*

Section 2. NOUNS WHICH DIFFER IN THE TWO LANGUAGES (*continued*)

MASCULINE

le chômage, *unemployment*
le creux, *hollow*
le concierge, *hall porter*
le côté, *side*
le ciel, *sky*, *heaven*
les cieux, *heavens*
le choix, *choice*
le crayon, *pencil*
les ciseaux, *scissors*
le cuir, *hide*, *skin of an animal*
le clou, *metal nail*
le carré, *square* (geometry)
le caoutchouc, *rubber*
le cheval, *horse*
le chemin, *road*
le chemin de fer, *railway*
le coiffeur, *hairdresser*
le coin, *corner*
le cerveau, *brain* (*intellect*, *mind*)
le chien, *dog*
le cadre, *frame*, *picture*
le cheveu, *hair*
le chapeau, *hat*
le cœur, *heart*
le crochet, *hook*
le congé, *leave*
le chaudron, *kettle*, *cauldron*
le couteau, *knife*
le cou, *neck*
le cochon, *pig*

FEMININE

la croyance, *belief*
la craie, *chalk*
la chaise, *chair*
la chair, *flesh*
la concurrence, *competition* (in business, etc.)
la courbe, *curve*
la chute, *fall*
la crainte, *fear*
la chaleur, *heat*
la connaissance, *knowledge*
la chanson, *song*
la chose, *thing*
la cire, *wax*
la cire à cacheter, *sealing-wax*
la croissance, *growth* (abstract)
la caserne, *barracks*
une cuiller, *spoon*
la consigne, *cloakroom*, *left-luggage office*
une commande, *an order*
une côte, *coast*, *rib*, *hill*
la cuvette, *basin*
la cloche, *large bell*
la cervelle, *brains* (anatomical)
la charrette, *cart*
la corne, *horn*
la clef, *key*
la charrue, *plough*
la chaussette, *sock*
la cuisine, *kitchen*, *cookery*
la colère, *anger*

FEMININE

la fille, *daughter*, *girl*
la fin, *end*
la fumée, *smoke*
la femme, *woman* (pronounce *famme*)
la femme de chambre, *chambermaid*
la facture, *invoice*, *bill*

MASCULINE

le gérant, *business manager*
le garçon, *boy*, *waiter*
le genre, *sort*, *kind*
le goût, *taste*
le gâteau, *cake*
le gant, *glove*
le genou, *knee*
le guichet, *ticket window*
les gages, *wages*
les gens, *people*

MASCULINE

un homme, *man*
un hiver, *winter*
un habit, *coat*

MASCULINE

un impôt, *tax*, *rates*

MASCULINE

le jour, *day*
le jeu, *game*
le jambon, *ham*
le Juif, *Jew*

MASCULINE

le lavabo, *lavatory basin*
le lit, *bed*
le livre, *book*
le loisir, *leisure*
le linge, *made-up linen*
le lait, *milk*
le lieu, *place*
les légumes, *vegetables*, *greens*

FEMININE

la livre, *pound*

MASCULINE

le montant, *amount*, *total*
le métier, *trade*, *business*, *vocation*
les moyens, *means*
les meubles, *furniture*
le morceau, *piece*, *lump*
le milieu, *middle*, *circle*, *element*
le mois, *month*
le matin, *morning*
le marin, *sailor*
le mouton, *sheep*
le mari, *husband*
le mot, *word*
le menton, *chin*
le marteau, *hammer*
le magasin, *store*, *large shop*
le mur, *wall*
le mouchoir, *handkerchief*

MASCULINE

le niveau, *level*
le nuage, *cloud*
le nœud, *knot*

FEMININE

la fourmi, *ant*
la feuille, *leaf*, *sheet* (of paper), *blade of grass*
la fourchette, *fork*
la fenêtre, *window*
la fois, *time*
une fois, deux fois, *once twice*

FEMININE

la glace, *ice*
la guerre, *war*
une goutte, *drop* (of water, etc.)
la grille, *railing*
la gare, *railway station*

FEMININE

l'herbe, *grass*
la haine, *hatred*, *hate*
l'haleine, *breath*
une huile, *oil*
la haie, *hedge*

FEMININE

la journée, *day* (duration)
la jointure, *joint*, *junction*
la jambe, *leg*
la Juive, *Jewess*

FEMININE

la lutte, *struggle*, *fight*, *wrestling*
la langue, *tongue*, *language*
la loi, *law*
la lumière, *light*
la laine, *wool*
la lame, *blade* (of knife)
la laitue, *lettuce*
la lèvre, *lip*
la lune, *moon*
la lecture, *reading*

MASCULINE

le maître, *master*
le maître d'hôtel, *head waiter*
Monsieur, *Sir*, *Mr.*

FEMININE

la morsure, *bite*
la mort, *death*
la moitié, *half*
la mer, *sea*
la mouche, *fly*
la main, *hand*
la maison, *house*
la muraille, *wall*
la montre, *watch*, *timepiece*
la matinée, *morning* (duration)
Mademoiselle, *Miss*
la mère, *mother*

MASCULINE

le nez, *nose*
le navire, *ship*
le Noël, *Christmas*

MASCULINE

le dos, *back* (of the body)
le déjeuner, *lunch*
le débat, *discussion*
le petit déjeuner, *breakfast*
le drap, *cloth*
le drapeau, *flag*
le dégat, *damage*
le dégoût, *disgust*
le début, *start*, *beginning*
le doigt, *finger*

MASCULINE

le doigt de pied, *toe*
le diable, *devil*
Dieu, *God*

FEMININE

la découverte, *discovery*
une dent, *tooth*
la douane, *Customs House*
la demoiselle, *girl*
la disparition, *disappearance*

MASCULINE

un évêque, *bishop*
un exemplaire, *copy*, *sample*
un échantillon, *sample* (of merchandise, etc.)
un écrasement, *crush*
un endroit, *place*
un événement, *event*
un étage, *floor* (storey of a house)
l'esprit, *spirit*, *wit*, *mind*
un été, *summer*
l'enseignement, *teaching*
l'ennui, *trouble*, *annoyance*, *boredom*
un éclat, *burst* (noise)
l'émail, *enamel*

MASCULINE

l'escalier, *staircase*
un état, *state*

FEMININE

une espérance, *hope*
une empreinte, *print*
une épreuve, *proof*
une espèce, *species*, *kind*, *sort*
l'eau, *water*
l'écriture, *writing*
une église, *church*
une épingle, *pin*
une étoile, *star*
une encre, *ink*

MASCULINE

le frère, *brother*
un fait, *fact*
le fer, *iron*
le fer-blanc, *tin*
le frein, *brake*
le fromage, *cheese*
le fusil, *gun*

MASCULINE

le four, *oven*
le fils, *son*
le fil, *thread*
le fil de fer, *wire*
le feu, *fire*
le fleuve, *large river*

Section 2. NOUNS WHICH DIFFER IN THE TWO LANGUAGES (*continued*)

FEMININE
la naissance, *birth*
la nourriture, *food, nourishment*
les nouvelles, *news*

MASCULINE
un oiseau, *bird*
l'or, *gold*
un os, *bone*
un œuf, *egg*
un œil, *eye*; **les yeux**, *eyes*

MASCULINE
le pain, *bread, loaf*
le petit pain, *roll of bread*
le pont, *bridge*
le pays, *country*
le partage, *division*
le père, *father*
le pli, *fold*
le plat, *flat, level*
le plaisir, *pleasure*
le pouvoir, *power, physical ability*
le prix, *price*
le pas, *step*
le faux pas, *slip, blunder*
le pourboire, *tip, gratuity*
le poids, *weight*
le poisson, *fish*
le panier, *basket*
le plancher, *floor*
le plafond, *ceiling*
le pied, *foot*
le poumon, *lung*

MASCULINE
le rire, *laughter*
le rayon, *ray*
le rhume, *cold* (disease), (**être enrhumé**, *to have a cold*)
le riz, rice
le rideau, *curtain*
le rabot, *plane* (tool)
le retour, *return*

FEMININE
la nuit, *night*
la neige, *snow*
la noix, *nut, walnut*

MASCULINE
un ongle, *finger* (or toe) *nail*

FEMININE
l'ouïe, *hearing*
une oreille, *ear*
une ombre, *shade, shadow*

MASCULINE
le parapluie, *umbrella*
le pardessus, *overcoat*
le poivre, *pepper*
le pouce, *thumb*
les Pâques, *Easter*
le peigne, *comb*
le poste, *position*

FEMININE
la pomme, *apple*
la pomme de terre, *potato*
la paille, *straw*
la poussière, *dust*
la peur, *fear*
la prise, *grip*
la perte, *loss*
la paix, *peace*
la peine, *punishment*
la pierre, *stone*
la pensée, *thought*
la porte, *door, gate*
la peau, *skin* (of a person)

FEMININE
la quinzaine, *fortnight*

MASCULINE
le renseignement, *information*
le roi, *king*

FEMININE
la racine, *root*
la rue, *street*
la roue, *wheel*
la reine, *queen*
la remise, *commission*

MASCULINE
le sang, *blood*
le soin, *care, attention*
le soulier, *shoe*
le siècle, *century*
le savon, *soap*
le secours, *help*
le singe, *monkey*
le saut, *jump*
le seau, *bucket*
le sel, *salt*
le sifflet, *whistle*
le sable, *sand*
le soir, *evening*
le soupir, *sigh*
le sucre, *sugar*

MASCULINE
le tiers, *third*
le tranchant, *cutting edge*
le trou, *hole*
le travail, *work, industry*
le tas, *heap*
le tirage, *pull, towing* (also *circulation of a newspaper*)
le tonnerre, *thunder*
le temps, *time, weather*
le tour, turn
le taureau, *bull*
le tiroir, *drawer*
le tuyau, *drain pipe, pipe*
le tort, *wrong, injury*
le trottoir, *pavement, sidewalk*
le trajet, *distance*

MASCULINE
le vol, *flight* (also *theft, robbery*)
le verre, *glass*
le versement, *payment* (into the bank)
le vernis, *polish, varnish*
le vent, *wind*
le vin, *wine*
le veston, *coat, jacket*
le vêtement, *garment*
le ver, *worm*

MASCULINE
le wagon-lit, *sleeping-car*
le wagon-restaurant, *dining-car*

MASCULINE
le sommeil, *sleep*
le sourire, *smile*
le soleil, *sun, sunshine*
le son, *sound*

FEMININE
la sonnette, *small bell*
la soie, *silk*
la semaine, *week*
la serrure, *lock*
la salle, *hall, room*
la salle à manger, *dining-room*
la santé, *health*
la soirée, *evening*

MASCULINE
le timbre, *stamp*
le toit, *roof*
le tapis, *carpet*

FEMININE
la toux, *cough*
la tante, *aunt*
la terre, *earth, land*
la tour, *tower*
la tasse, *cup*
la taille, *build, figure*
la toile, *linen* (not made up)
la tête, *head*
la tige, *stem*
la traite, *the draft* (bank)
la tranche, *slice, edge*
la tache, *stain, spot*
la tâche, *task*

FEMININE
la viande, *meat*
la voix, *voice*
la vague, *wave*
la voiture, *cab, car, vehicle, taxi*
la vingtaine, *score (twenty)*
la vache, *cow*
la volaille, *fowl*
la voile, *sail*
la vis, *screw*
la ville, *town, city*

Section 3. DAYS OF THE WEEK, MONTHS, SEASONS, COUNTRIES

Days of the Week

dimanche, *Sunday*
lundi, *Monday*
mardi, *Tuesday*
mercredi, *Wednesday*
jeudi, *Thursday*
vendredi, *Friday*
samedi, *Saturday*

Seasons

le printemps, *spring*
l'automne, *autumn*
l'été, *summer*
l'hiver, *winter*

Names of Countries

l'Angleterre, *England*
la Grande-Bretagne, *Great Britain*
le Royaume-Uni, *the United Kingdom*
les États-Unis, *the United States*
l'Amérique, *America*
la France, *France*
l'Allemagne, *Germany*
l'Italie, *Italy*
l'Espagne, *Spain*
la Russie, **L'Union Soviétique**, *Russia*

Months of the Year

janvier
février
mars
avril
mai
juin
juillet
août
septembre
octobre
novembre
décembre

The Disuse of Capital Letters in French

Capital letters are *not used* for days of the week, months of the year, national adjectives or personal titles. **Il partira mardi. Le français est une langue assez difficile.**

NOTE.—**Je suis français**, *I am French* (French is an adjective). **L'Allemand, l'Anglais**, *the German, the Englishman*; here **Allemand** and **Anglais** are nouns, and are written with capitals.

LESSON 5

Adjectives and Numbers

DEFINITE and indefinite articles and the proper methods of their use have been dealt with, and the student has been given a carefully selected vocabulary of essential nouns arranged in three sections. Next, to deal with the adjectives, their genders and numbers, comparisons and use with nouns. There then follows a vocabulary of essential adjectives similar to the earlier one given for nouns, and an exercise makes clear the agreement of adjectives with nouns.

An adjective is a word used to describe the quality of a noun.

GENERAL RULE.—In French the adjective agrees in gender and number with the noun, and usually follows it : **l'Académie française,** *the French Academy*, **les hommes sourds et muets,** *the deaf and dumb men.*

Feminine of Adjectives

The feminine of an adjective is formed by adding **-e** mute ; those already ending in **-e** mute do not change.

Adjectives ending in **-s, -l, -n, -t,** double the last letter and add **-e** mute.

Those in	**-f**	change it	to	**-ve**
,,	**-x**	,,	,,	**-se**
,,	**-eur**	,,	,,	**-euse**
,,	**-eau**	,,	,,	**-elle**
,,	**-g**	,,	,,	**-gue**
,,	**-c**	,,	,,	**-que**
,,	**-er**	,,	,,	**-ère**

Examples

exprès	becomes	in the	feminine	**expresse**
muet	,,	,,	,,	**muette**
pareil	,,	,,	,,	**pareille**
bon	,,	,,	,,	**bonne**

NOTE WELL : **beau, belle,** *beautiful* ; **nouveau, nouvelle,** *new* ; **fou, folle,** *mad* ; **mou, molle,** *soft* ; **vieux, vieille,** *old* ; **franc, franche,** *free* ; **blanc, blanche,** *white* ; **sec, sèche,** *dry* ; **doux, douce,** *sweet* ; **faux, fausse,** *false* ; **frais, fraîche,** *fresh.*

The special masculine forms, **vieil, bel, nouvel, fol,** and **mol** are used before nouns beginning with a vowel or an **h** mute.

Plural of Adjectives

The plural is formed by adding **-s** (silent) to the singular ; if this already ends in **-s,** there is no change.

Adjectives ending in **-al** change it to **-aux** in the masculine plural ; those in **-eau** add **-x** ; those in **-x** do not change in the masculine plural, but change **-x** to **-ses** in feminine plural.

Thus, **égal, égaux,** *equal*, **heureux, heureuses** (fem. plur.), *happy*.

NOTE.—**bleu, bleus,** *blue*, and **tout, tous, toute, toutes,** *all.*

Comparison of Adjectives

	1	2	3
Superiority :	**plus** (adjective) **que** *more . . than*		
	plus rouge que *. redder than*		
Inferiority :	**moins** (adjective) **que** *less than*		
	moins blanc que *. less white than .*		
Equality :	**aussi** (adjective) **que** *as . as.*		
	aussi bleu que *. as blue as*		

Than before a number is always *de* ; **plus de trois,** *more than three.*

Very . **très, fort, bien. Très bon,** *very good.*
le plus, le moins, *the most, the least.*
l'homme le plus brave, *the bravest man*, etc.

DISTINGUISH : **bon,** *good* ; **meilleur,** *better*, **le meilleur,** *the best* ; **mauvais,** *bad* ; **pire,** *worse*, **le pire,** *the worst* (also **le plus mauvais**) ; **petit** has the forms **moindre** and **le moindre** in addition to **plus petit** and **le plus petit.**

From the adverbs : **bien,** *well* ; **mieux,** *better*, **le mieux,** *the best* ; **mal,** *badly* ; **pis,** *worse*, **le pis,** *the worst.*

NOTE.—**beaucoup,** *much* ; **plus,** *more*, **le plus,** *most* ; **peu,** *little* ; **moins,** *less*, **le moins,** *least.*

Adjectives Before the Noun

The following adjectives come *before* the noun (otherwise the adjective comes after) :

beau, *beautiful*	**long,** *long*
brave, *brave*	**mauvais,** *bad*
bon, *good*	**méchant,** *wicked*
cher, *dear, cherished*	**meilleur,** *better*
dernier, *last*	**moindre,** *less*
digne, *worthy*	**petit,** *little*
grand, *great, high, tall*	**pire,** *worse*
gros, *big, fat*	**premier,** *first*
haut, *high*	**sot,** *foolish*
jeune, *young*	**vieux,** *old*
joli, *pretty*	**vilain,** *ugly*

NOTE.—**Un honnête homme,** *an honest man* : **Un homme honnête,** *a civil man.* **Le plus grand DU monde,** *the greatest* IN THE *world.*

Possessive Adjectives

My, your, his, etc., are treated under pronouns.

Vocabulary—Essential Adjectives

Section 1. ADJECTIVES SIMILAR IN FORM OR USAGE IN FRENCH AND ENGLISH

acide, *acid*
automatique, *automatic*
aimable, *kind*
avide, *greedy*

brillant, *bright*
brun, *brown*
blond, *fair*
blanc, *white*

capable (de), *able*
chimique, *chemical*
clair, *clear, light* (of colours), *bright*
complexe, *complex, complicated*
complet, *complete*
compliqué, *complicated*
cruel, *cruel*

dépendant (de), *dependent (upon)*
direct, *direct*
demi, *half*
délicat, *delicate*
différent, *different*

élastique, *elastic*
électrique, *electric*
égal, *equal*
étrange, *strange*

fertile, *fertile*
fixe, *fixed*
faible, *feeble*
fatigué, *tired*
femelle, *female*

général, *general*
grand, *great*
gros, *coarse, bulky, stout*

humide, *damp*

important, *important*
inquiet (de), *uneasy (with)*

actif, *active*
absent, *absent*
agréable, *agreeable*

bleu, *blue*
banal, *commonplace*
brave, *brave*

calme, *quiet*
certain, *certain*
convenable, *suitable*
commun, *common, ordinary*
curieux, *curious*
charmé (de), *charmed (with)*
contraire (à), *opposite (to)*

délicieux, *delightful*
double, *double*
désagréable, *unpleasant*
drôle, *droll, odd*

extraordinaire, *extraordinary*
extrême, *violent*
exact, *exact*
élevé, *raised, exalted*

ferme, *firm, solid, hard*
futur, *future*
fameux, *famous*
frais, *fresh*
fin, *fine, delicate*

grave, *serious*
gentil, *nice, pleasant, kind*
grossier, *rude, vulgar*

international, *international*

juste, *exact, right*

large, *wide*

maladroit, *clumsy*
mâle, *male*
masculin, *masculine*
marié, *married*
matériel, *material*

natural, *natural*
nécessaire, *necessary*

ordinaire, *common*

profond, *deep*
parallèle, *parallel*
passé, *past*
physique, *physical*
politique, *political*
possible, *possible*
privé, *private (intimate)*
particulier, *private (individual)*

rouge, *red*
régulier, *regular*
rond, *round*
rude, *rough*

sage, *wise*
sauf, *safe*
second (deuxième), *second*
séparé, *separate*
sérieux, *serious (-minded)*
secret, *secret*

tardif, *slow*
tranquille, *quiet, peaceful, at rest*

uniforme, *equal, uniform*
uni, *united*

violent, *violent*

long, *long* (of distance)

médical, *medical*
militaire, *military*
mortel, *mortal*
massif, *solid*
mystérieux, *mysterious*

normal, *normal*
naïf, *artless, naive*

présent, *present*
probable, *probable*
public, *public*
principal, *chief*
poli, *polished, polite, smooth*
plaisant, *pleasing, funny*
pur, *pure*

rapide, *quick* (express, of trains, etc.)
ridicule, *foolish*
rare, *rare, small*

simple, *simple*
solide, *solid*
spécial, *special*
sûr, *certain, sure*
silencieux, *silent*
suspendu (à), *hanging (from)*

tendre, *tender*
troublé, *disturbed, uneasy*

utile, *useful*
unique, *unique*

Section 2. ADJECTIVES WHICH DIFFER IN THE TWO LANGUAGES

à part, *separate*
à venir, *future*
à bon marché, *cheap*
amer, *bitter*

bouilli, *boiled*
bon, *good*
bas, *low*
brisé, *broken*

cassé, *broken*
coupé, *cut*
caché, *hidden*
collant, *sticky*
chaud, *hot*
courbé, *bent, curved*
cher, *dear*

digne, *worthy*
droit, *right, straight*
dur, *hard*
doux, *sweet, quiet*
dernier, *last*

épais, *thick*
éveillé, *awake*

aigu, *acute, sharp*
aveugle, *blind*
actuel, *present, contemporary*

bête, *stupid, foolish*
boiteux, *lame*
beau (belle), *beautiful*
bienvenu, *welcome*

en colère, *angry*
creux, *hollow*
chauve, *bald*
commode, *convenient*
croyable, *credible*
cru, *raw*

défendu, *forbidden*
délié, *loose*
défait, *undone*
disparu, *disappeared*

étroit, *narrow*
estropié, *crippled*

fâché contre, *angry with*
fâché de, en, que, *sorry for, to, that*
foncé, *dark* (of colours: **bleu, foncé,** etc.)

gras, *fat*
gris, *grey*

haut, *high, tall* (of a building)
heureux, *happy*

ingénu, *simple*

jaune, *yellow*
jeune, *young*

libre, *free, loose*
lent, *slow*
lointain, *far*

même, *same*
mouillé, *wet, damp*
mélangé, *mixed* (to a consistency)

fort, *strong, loud, violent*
froid, *cold*
faux, *false, wrong, deceitful*
fier, *proud*

gauche, *left* (**à la main gauche,** etc.)

à haute voix, *loud*
habile, *clever*

instruit, *educated*

joli, *pretty*

lourd, *heavy*
léger, *light* (in weight), *light* in colour is **clair**)

mauvais, *bad, evil*
mort, *dead*
malade, *ill*
mêlé (de), *intermixed (with)*

Section 2. ADJECTIVES WHICH DIFFER IN THE TWO LANGUAGES *(continued)*

mou, *soft*
malpropre, *dirty*
méchant, *wicked*

noir, *black*
nu, *naked*

ouvert, *open*

propre, *clean*
plein (de), *full (of)*
pareil (à), *equal, similar (to)*
prêt (à), *ready (to)*

raide, *stiff*
rompu, *broken*

semblable (à), *similar (to)*
sensible, *sensitive, tender*
sain, *healthy*
subit, *sudden, unexpected*
serré, *closed, tight*

muet, *dumb*
mûr, *ripe*
maigre, *thin*

nouveau, *new*

plat, *flat*
petit, *little, small*
puissant, *powerful*
pudique, *chaste, modest*

reconnaissant, *grateful*

sale, *dirty*
sec (sèche), *dry*
soigneux (de), *careful of, (to)*
sourd, *deaf*

seul, *alone*
salé, *salted*

triste, *sad*
tranchant, *sharp, cutting*
tiède, *warm, lukewarm*

vivant, *living*
vif, *sharp, active, keen*
vrai, *true*
vert, *green*
vieux, *old*

sucré, *sweet*
sot, *foolish*

trompeur, *deceptive*
têtu, *obstinate, self-willed*

vite, *swift, quick, speedy, rapid*
vide, *empty*
vilain, *ugly*
voisin (de), *neighbouring, next (to)*

Adjectives of Nationality

anglais, *English*
français, *French*
allemand, *German*
américain, *American*
chinois, *Chinese*

italien, *Italian*
espagnol, *Spanish*
russe, *Russian*
polonais, *Polish*
japonais, *Japanese*

NOTE. Adjectives of nationality are spelt with *small* letters in French

EXERCISE ON AGREEMENT OF ADJECTIVES WITH NOUNS

Avant d'être comptable, M. Dupont était voyageur de commerce ;
Before being *an* accountant, Mr. D. was *a* commercial traveller ;
il était *jeune* **alors, et très** *bon* **marcheur ;**
he was young then, and *a* very good walker ;
il a pu voir ainsi presque *toute* **la France**
he was thus able to see nearly the whole of France
la Champagne et ses vignes *bleutées*,
the bluish vines of Champagne,
les villes du Nord avec leurs toits *pointus* **et leurs églises** *fameuses*,
the cities of the North with their pointed roofs and their *famous* churches,
Paris et ses cent merveilles toujours *variées*,
Paris and its hundred wonders, ever-varying,
les *longues* **plaines de la Beauce,**
the boundless plains of Beauce,
les ruines *romaines* **de la Provence,**
the Roman ruins of Provence,
les châlets *pittoresques* **des Alpes,**
the picturesque chalets of the Alps,
les côtes *rocheuses* **de la Bretagne,**
the rocky coasts of Brittany,
le bruit *charmeur* **des vagues de la Manche sur des plages de sable** *fin*.
the fascinating noise of the Channel waves on beaches of fine sand
Une femme qui ne peut pas parler est *muette* ,
A woman who cannot speak is dumb ,
si elle ne peut pas entendre, elle est *sourde*
if she cannot hear, she is deaf.
Si elle n'est plus *jeune*, **elle est** *vieille* ,
If she is no longer young, she is old ;
si elle a perdu la raison, elle est *folle*.
if she has lost her reason, she is mad
Pauvre femme ! Parce qu'elle nous offre un exemple *commode* **pour notre grammaire, nous la couvrons de calamités !**
Poor woman ! Because she offers us a convenient example for our grammar, we heap calamities on her !
Elle est bien *bonne* **de se laisser faire.**
What a fool to allow herself to be treated thus !

NUMBERS

Cardinal Numbers

1 **un, une**
2 **deux**
3 **trois**
4 **quatre**
5 **cinq**
6 **six**
7 **sept**
8 **huit**
9 **neuf**
10 **dix**
11 **onze**
12 **douze**
13 **treize**
14 **quatorze**
15 **quinze**
16 **seize**
17 **dix-sept**
18 **dix-huit**
19 **dix-neuf**
20 **vingt**
21 **vingt et un**
22 **vingt-deux**
30 **trente**
40 **quarante**
50 **cinquante**
60 **soixante**
70 **soixante-dix**
80 **quatre-vingts (-vingt un, et**
90 **quatre vingt-dix**
100 **cent, cent un, etc.**
1,000 **mille, mille un, etc., deux mille**
1 *million*, **un million**

Six, pronounce like
Dix, pronounce like

Ordinals

1er **premier,** *first*
2e **deuxième,** *second*
3e **troisième,** *third*
4e **quatrième,** *fourth*
5e **cinquième,** *fifth, etc*
6e **sixième**
7e **septième**
8e **huitième**
9e **neuvième**
10e **dixieme**
21e **vingt et unième**
31e **trente et unième**
100e **le centieme**
1,000e **le millième**

Miscellaneous

une fois, *once*
deux fois, *twice, etc*
le double, *double*
le triple, *treble*
le tiers, *third*
le quart, *quarter*
la huitaine, *collection of eight* (also, *a week*)
la dizaine, *collection of ten*
la douzaine, *the dozen*
une quinzaine, *fortnight*
une vingtaine, *score*
une paire de, *a pair of*
une couple, de, *a couple, of*
la plupart, de, *most, of*
un grand nombre, *a great number*
le quadruple, *quadruple, etc*
le demi-, *half-*
la moitié de, *the half of*
une centaine de, *a hundred of*
un huit jours, *a week*
il y a huit jours, *a week ago*
d'aujourd'hui en quinze (jours), *this day fortnight*
la semaine, *the week*
la semaine prochaine, *next week*
la semaine dernière, *last week*

Different usage of numbers in French

Use **cardinal numbers** for : *kings, dates, page, chapter*, and *verse*—excepting *premier* :

Edouard VII. Le 10 mars. Chapitre vingt ; page soixante et un. Henri premier

Time of Day

Quelle heure est-il ? *What time is it ?*

Il est une heure, deux heures, minuit (midnight), **midi** (noon), **cinq heures et quart, demi.**

Il est six heures moins un quart.

Il est huit heures dix, quinze, etc.

Measurement

Quelle est la longueur de cette chambre ?

Elle est longue de 10 mètres.

Haut[1] de, profond[2] de, épais[3] de.

Cette chambre a 20 mètres de long SUR 10 mètres de large.

[1]*high.* [2]*deep.* [3]*thick, broad.*

EXERCISE AND REVISION

Quel jour *sommes-nous* **? Mardi, le 10 (dix) Octobre.**
What is the date to-day ? Tuesday, October 10th

On célèbre en France la fête nationale *le* **14 juillet, en souvenir de la prise de la Bastille, le** *quatorze* **juillet dix-sept cent quatre-vingt-neuf.**
(The) National Day is kept in France on the 14th of July, in commemoration of the fall of the Bastille, on the 14th of July, 1789

Deux *mille* **hommes étaient présents à la cérémonie, jeudi dernier, 12** (*douze*) **septembre, à trois heures de l'après-midi (à quinze heures).**
Two thousand men were present at the ceremony, last Thursday, September the 12th, at three p.m.

Le **roi François Ier** (*premier*) **fonda Le Havre en 1517.**
King Francis the first founded Havre in 1517.

Henri IV (*quatre*) **fut un roi populaire.**
Henry IV was a popular king

Nous partirons d'aujourd'hui en quinze.
We shall be leaving a fortnight today

Galland publia en 1704 sa fameuse traduction des ' Mille et Une Nuits.'
Galland published in 1704 his famous translation of the " Arabian Nights "

Quelle heure est-il ? Midi et demi, exactement. Moi, je fais midi moins le quart. Votre montre *retarde* **sans doute ? A moins que ce ne soit la vôtre qui** *avance*
What time is it ? Half past twelve, precisely *I* make it a quarter to twelve Your watch is probably slow ? Unless it is *yours* which is fast

On affranchit une lettre à un franc vingt-cinq centimes.
The postage rate for a letter is Fr. 1,25

J'ai dix-huit ans depuis hier. Bon anniversaire !
I was eighteen yesterday Many happy returns !

Un billet *de* **dix francs ; un timbre** *de* **cinquante centimes ; une pièce** *de* **vingt francs.**
A ten franc note ; a fifty centime stamp ; a twenty franc piece

Le **français est une belle langue, avec une littérature riche et variée.**
French is a fine language, with a rich and varied literature.

On le parle, en dehors de la France et de son Empire colonial, dans une partie de la Belgique (Bruxelles) et de la Suisse (Genève), au Canada, dans les Antilles (Haïti, la Martinique), aux Nouvelles Hébrides.
It is spoken, outside France and her colonial Empire, in (a) part of Belgium (Brussels) and of Switzerland (Geneva), in Canada, in the West Indies, (Haiti, Martinique) and in the New Hebrides

MM. Meillet et Cohen écrivent : " Le français est parlé par les gens cultivés de nombreux pays dans l'Europe centrale et sud-orientale, en Egypte et en Asie Mineure."
Mr M. and Mr C. write " French is spoken by the educated classes of many countries in Central and South-Eastern Europe, in Egypt and in Asia Minor."

C'est la langue officielle d'environ 100,000,000 de personnes, dont 48,000,000 la parlent comme langue maternelle.
It is the official language of about 100,000,000 people, 48,000,000 of whom speak it as their mother tongue

Place of Adjectives

Ce chapeau est neuf ; cette robe est *neuve*. **Ces deux objets sont** *neufs*, **par conséquent.**
This hat is new ; this gown is new These two things are new, therefore

C'était un petit homme, *vieux* **et** *sale*, **qui portait un veston** *noir* **et un chapeau** *mou décoloré*.
He was a dirty little old man, wearing a black jacket and a discoloured soft hat

Il allait *nu-tête*, **un** *gros* **sac** *jaune* **sous le bras** *gauche*, **et le** *vieux* **chien** *fidèle* **suivait . . .**
He went bare headed, a big yellow bag under *his* left arm, and the faithful old dog followed . . .

" La *jeune* **fille aux yeux** *bleus*" **est le titre de son** *dernier* **tableau.**
" Girl with blue eyes " is the title of his last picture

Tous les hommes sont égaux devant la loi.
All men are equal before the law

Cet appartement est très confortable : les pièces en sont grandes et claires.
This flat is very comfortable the rooms are big and light

La rue est tranquille, et propre.
The street is quiet, and clean

Il y a un jardin public tout près, où le petit Jacques peut jouer *toute* **la journée.**
There is a public garden close by, where little Jim can play all day long.

Paris a *plus* **d'habitants** *que* **Lyon, mais** *moins* *que* **Londres.**
Paris has more inhabitants than Lyons but less than London

Londres, capitale de l'Angleterre, est *la plus* **grande ville du monde.**
London, *the* capital of England, is the greatest city *in* the world

La grammaire française est *plus* **difficile** *que* **la grammaire anglaise.**
(The) French grammar is more difficult than (the) English grammar

Cette pièce est *plus* **longue** *que* **large.**
This room is longer than it is wide

Jean est *plus* **grand** *que* **vous.**
John is taller than you.

J'en ai une, et vous en avez trois : c'est vous *qui* **en avez** *le plus*
I have one (of them), and you have three it is you who have the most

Ce vin n'est peut-être *pas aussi* **fameux** *que* **celui-là, mais il est** *aussi* **bon, et** *moins* **cher.**
This wine is perhaps not as famous as that one, but it is just as good, and less expensive

Irregular Comparison of Adjectives

Avec ce garçon il faut s'attendre au *pire*
From this boy one must expect the worst

Il ne faut pas la punir ; elle a fait de son *mieux*
You must not punish her ; she did her best

Ses affaires allaient *de mal en pis*
His business was going from bad to worse

Practice on Pronouns (*page* 684)

Je **suis étudiant ;** *mon* **nom est Robert. Mon père est docteur.** *Ma* **mère n'a pas de profession, mais elle aide mon père, et s'occupe de la maison ;** *mes* **deux frères vont encore à l'école.**
I am *a* student , my name is Robert My father is *a* doctor. My mother has no profession, but she helps my father, and looks after the house ; my two brothers are still going to school.

Ils y vont à bicyclette, car *elle* se trouve à deux kms. (kilomètres) de chez nous. Mon père n'en est pas fâché, cela *leur* donne de l'exercice. Je *me* lève en même temps qu'*eux*, et ils m'accompagnent jusqu'à la gare, où je prends le train de Paris à 8 h. 57.

They go there on their bicycles, for it is 2 kms (roughly 1 mile) from home. My father does not mind that, it is good exercise for them. I get up at the same time as they do, and they accompany me as far as the station, where I take the 8.57 to Paris.

Avez-vous lu ce livre ? *Ai-je* encore le temps de . . . ? *A-t-il* regardé s'il y avait des lettres ? *Iront-ils* à Deauville cette année ? Que *voulez-vous* que j'y fasse ?

Have you read this book ? Have I got enough time to . . . ? Has he seen whether there were any letters ? Will they be going to Deauville this year ? What do you want me to do ?

Voyez-vous ce paquet là-bas ? Donnez-*le moi*. Portez-le *lui* dès demain matin. Rendez-*les* nous aussitôt que possible. Quelle est la réponse de ce problème ? Attendez ! Ne me *la* dites pas ! Je veux la trouver tout seul.

Do you see that parcel over there ? Give it to me. Take it to him early to-morrow. Give them back to us as soon as possible. What is the solution of this problem ? Wait ! Don't tell (it to) me ! I shall find it myself.

Adjectives Preceding the Noun

J'espère que ce *beau* temps va durer jusqu'à la semaine prochaine.

I hope this fine weather will last until next week.

Le *digne* homme n'avait pas toujours *bon* caractère ; il ne permettait pas la *moindre* infraction aux règlements de l'école. Les *jeunes* gens l'aimaient pourtant, et les *grands* élèves l'appelaient : " ce *cher* M. Lamouvette."

The worthy man was not always good-tempered ; he would not tolerate the least infraction of the school rules. The boys loved him though, and the older pupils called him " that dear Mr. Lamouvette."

Regardez-moi ce *vilain petit* garçon, comme il est sale !

Just look at this bad little boy, how dirty he is !

Ennemi intelligent vaut mieux que *sot* ami.

Better a wise enemy than a foolish friend.

Miscellaneous

Mes amis, mes chefs, mes employés, tout le monde me trouve trop gros. Etes-vous de *leur* opinion ? Donnez-moi donc l'adresse de *votre* gymnase, que je perde *ce* poids inutile.

My friends, my superiors, my staff, everybody thinks I am too fat. Do you share their opinion ? If so, give me the address of your gymnasium, so that I can lose this useless weight.

Ce chapeau *cette* canne ferrée, *ces* lunettes, *ce* sac ... Ah çà ! partiriez-vous faire l'ascension du Mont Blanc ?

Why the hat, the alpenstock, the spectacles, the rucksack ? Dear me ! Can it be that you are going to climb (the) Mont Blanc ?

Veuillez croire, Monsieur, à l'expression de *mes* sentiments, distingués.

Believe me, Sir, yours very truly (ending for a letter).

LESSON 6

Practice on Lessons 1—5 and Exercises

At this point it will be valuable to go over again the ground so far covered—both Lessons and Exercises. As emphasised already in page 666, it is essential in learning a language to make certain of the basis before advancing, and it is even more important, in the method adopted in this Course, to make completely sure of each step before proceeding to the next. Hence the necessity for revision work. This Lesson therefore consists of sentences and phrases which require the use of the vocabularies of essential nouns which should now have been learned, the articles, adjectives, and numbers. It concludes with a few important idiomatic phrases.

GENERAL EXERCISE FOR REVISION

Chacun sait que Londres est la ville des brumes : *on* dit que

Everybody knows that London is a city of mists : they say that

Londres sans le brouillard n'est plus Londres. Pourtant, il ne

London without fog is no longer London. However, you

faut *rien* exagérer. Si *quelqu'un* était amené, les yeux bandés,

must not exaggerate anything. Were somebody to be brought, blindfold,

dans le parc de St. James, un beau matin de printemps *rien ne* lui suggérerait

into St. James's Park, one fine Spring morning, nothing would suggest

la grande ville enfumée que *tout le monde* connaît :

to him the great smoky city (that) everyone knows

Londres n'est *ni* la ville de la pluie et des brumes, *ni* la ville

London is neither a city of rain and mists, nor a city

des parcs et des jardins : c'est à la fois *l'un et l'autre*

of parks and gardens : it is both at the same time

REVISION EXERCISES ON NUMBERS

La France adopta le système métrique après la Révolution.

France adopted the metric system after the Revolution

l'unité monétaire est le franc, qui se divise en cent centimes ;

The monetary unit is the franc, which is divided into one hundred centimes ;

l'unité de longeur est le mètre, qui se divise en cent centimètres, etc.

the unit of length is the metre, which is divided into one hundred centimetres, etc.

Ainsi, toutes les opérations d'arithmétique

Thus, all (the) operations of arithmetic

se rapportant aux mesures de longueur, aux poids, à l'argent, etc., sont

relating to measures of length, to weights, to money, etc., are

très faciles. Soit par exemple vingt-sept mètres cinquante de

very easy. For example, take twenty-seven and a half

drap à neuf francs quarante *le* mètre : quel est le prix total

metres of cloth at nine francs forty centimes *a* metre : what is the

du drap ? Nous multiplions le nombre de mètres par le nombre de

total cost of the cloth ? We multiply the number of metres by the number of

francs, nous séparons les deux décimales par une ***virgule*****, et**
francs, we separate the two decimals figures by a *comma*, and
nous avons immédiatement le résultat : soit la multiplication
we have the result immediately ; thus :
27,5 × 9,4 = 258,50.
Le prix du drap est de deux cent cinquante
The cost of the cloth is two hundred and fifty-
huit francs cinquante centimes. Combien ***plus*** **compliquée serait**
eight francs fifty centimes. How much more complicated would be
une opération semblable en mesures et en monnaies anglaises ! Soit
a similar operation with English measures and English money ! Let us say
27 yards, 2 pieds et 3 pouces de drap à 2 shillings et 11 pence
27 yards 2 feet 3 inches of cloth at 2 shillings and 11 pence
le yard !
(a) yard !

La superficie de ***la*** **France est** ***de*** **550,926 Km. (kilomètres) carres ;**
The area of France is 550,926 square kilometres ;
sa population est ***de plus de*** **quarante et un millions**
her population exceeds forty-one million
d'habitants. De tous les fleuves de France, la Loire, qui
inhabitants. Of all the rivers *in* France, the Loire, which
passe à Orleans et a Nantes est ***le plus*** **long ; il a environ**
flows through Orleans and Nantes, is the *longest* , it is about
mille kilometres ***de*** **long. Le Mont-Blanc est** ***haut de*** **quatre**
one thousand kilometres in length. Mont Blanc is four thousand
mille huit cent dix mètres ; c'est la montagne ***la plus*** **haute**
eight hundred and ten metres high , it is the *highest* mountain
des Alpes. La Tour Eiffel a trois cents mètres ***de haut.***
in the Alps. The Eiffel Tower is three hundred metres high

REVISION EXERCISE

Nous savons que la France s'appelait autrefois la Gaule ;
We know that France was formerly called Gaul ;
elle était habitée par différentes populations, en majorité
it was inhabited by various populations, mostly
par des Celtes (les Gaulois), que l'on représente avec ***des*** **cheveux**
by Celts (the Gauls), whom one pictures with blonde
blonds, de grandes moustaches et ***un*** **casque ailé. Il y**
hair big moustaches and winged helmets There
avait aussi d'autres peuples, des Grecs par exemple, qui fondèrent
were, too, other peoples, e.g. (some) Greeks, who founded
une colonie dans le sud appelée Massilia (aujourd'hui
a colony in the South called Massilia (the Marseilles of
Marseille) vers 600 (six cents) avant J.C. Puis vint la
to-day) circa 600 B.C. Then came the
conquête romaine dirigée par Jules César, qui eut pour résultat
Roman conquest led by Julius Caesar, which resulted in
d'introduire la civilisation et la langue latines en Gaule.
the introduction of Latin civilization and language into Gaul.
Après les Romains vinrent d'autres invasions, les Francs, les
After the Romans came other invaders. Frank tribes,
Normands, etc. Mais le pays connut une première unité avec le
Northmen, etc However, the country knew a first unity under
roi Clovis, que se convertit au Christianisme en 499 (quatre cent quatre-vingt dix-neuf) après J.C.
King Clovis, who became converted to Christianity in A.D 499
Ainsi la France grandit peu a peu pendant le Moyen-Âge, sans
Thus France grew little by little during the Middle Ages, without
avoir le sentiment réel d'être une nation dans le sens que nous
having the real feeling of being a nation in the sense that we
donnons à ce mot C'est Louis XI (onze) qui commença à centraliser
give to this word to-day It was Louis XI who began centralising
les différentes provinces du royaume autour de la personne
the various provinces of the kingdom around the person
du Roi. Avec Louis XIV (quatorze) et sa cour, groupee au
of the King With Louis XIV and his court gathered at
château de Versailles, nous arrivons au "grand siecle" et à
the chateau of Versailles we come to the "great century" and the
la grande epoque classique du français : Moliere, Racine, Corneille
Golden age of classical French Moliere Racine, Corneille
en sont les grands noms. Les erreurs de la monarchie
are among its greatest names The errors of absolute
absolue amenèrent une réaction sous Louis XVI (seize) , ce
monarchy led up to a reaction under Louis XVI , it was
fut la Révolution, symbolisée par la chute de la prison de la
the Revolution, which is symbolised by the fall of the prison of the
Bastille, le 14 Juillet 1789 (dix-sept cent quatre vingt neuf).
Bastille, on July 14th, 1789
Cette date a été choisie comme Fête Nationale par la Republique.
This date has been chosen as National Day by the Republic
La devise de la République française devint : Liberte, Egalité, Fraternité.
The motto of the French Republic became : Liberty, Equality, Fraternity

IDIOMATIC PHRASES

De **quoi parlez-vous ?**
What are you talking about ?
Je vais ***à l'école*** **;** ***à l'église*** **,** ***a la*** **maison.**
I go to school ; to church , home.
Je suis ***chez moi*****, M. Dupont est chez** ***lui*****, sa mère est chez** ***elle*** **. nous sommes bien chez** ***nous*** **; quand serez-vous chez** ***vous*** **? Je ne suis pas allé les voir chez** ***eux*** **depuis longtemps.**
I am at home, Mr. Dupont is at home, his mother is at home , we feel comfortable at home , when will you be at home ? I have not been to see them at their home for a long time.
Jetez **donc un coup d'œil autour de vous.**
Do cast a glance around you.

General Rule

All verbs ending in **-er** are conjugated similarly to **parler** ;

All ending in **-ir** are conjugated similarly to **finir** ;

All in **-oir** to **recevoir** and all in **-re** to **vendre**.

Those which do not follow this general rule are called IRREGULAR VERBS, and all required for practical purposes are given after the "Model" Conjugations in pages 687 and 688

Formation of Tenses

For purposes of reference a Table and rules for the complete CONJUGATION OF VERBS in **-er, -ir, -re,** is given below. **-oir** will be found later, and the tenses of it not given would follow those below.

The **Future** is formed by *adding to the Infinitive the endings in the table*. Similarly the **Conditional.**

The **Present Participle** gives . **Present Indicative Plural** by changing **-ant** into the endings given in the table. It also gives similarly the **Imperfect Indicative** and the **Present Subjunctive.**

Note that in verbs ending **-oir.** c always changes to **ç** before **a, o, u.**

The **Past Participle** gives *all compound tenses, with an auxiliary*.

The **Present Indicative** provides the **Imperative,** simply by *dropping the pronouns* :

Prends, prenez, *take.*

The **Past Definite** (sometimes called the Preterite, or the Historical Past) used in narrative literature - never in speech - is formed by *adding the endings in the table to the infinitive without* **-er, -ir, -oir, -re.**

Thus, **je PARL-ai** (written **parlai**), **tu parlas,** etc

The **Past Subjunctive** is formed by *adding the endings in the table to the second person singular of the Past Definite* :

Que je parlas-se, que tu parlas-ses, qu'il parlât, etc

Note on the Subjunctive

The student who aspires to become an adept at translation *into* French must go to some other book for instruction in the use of the Subjunctive. For ordinary purposes, one should be able to recognize a tense in the Subjunctive, a mood which does not greatly matter in English. It *can* be avoided in French with a little ingenuity. For example :

I must go **il faut** (*It is necessary*) **que j'aille** (*that I go,* **subjunctive**). Equally correct **Il faut aller** (**Infinitive**) or, rather *more emphatic,* **je dois aller** (**DEVOIR**).

Analysis of the French Verb—for Reference

To-day many French scholars prefer a new and slightly different approach to the conjugation of the verb. All verbs may be analysed into the following divisions for purposes of conjugation :

LIVING CONJUGATION : *All* verbs *ending in* **-er,** verbs *ending in* **-ir** which are *inchoate* (or indicate beginning)

DEAD CONJUGATION : *Non-inchoate* verbs in **-ir** All others

From this follows a very practical rule :

Learn the conjugation of a verb ending in **-er,** *and that of one ending* **-ir,** with plural in **-iss (nous finissons)** and consider *all other verbs are or may be irregular* This acts as a warning

Table of Past Participles

	Infinitive	Past Participle always ends .
LIVING CONJUGATION	-er	é
	-ir	i
DEAD CONJUGATION	-ir	u or i
	-re	u, i, is, it
	-oir	u

Note that nearly all *living inchoate* verbs are *formed from an adjective* : **(vert, lent).**

Also note that it is the **-iss** element which is missing from the dead verbs : **nous mourons, nous partons.**

It appears, however, from experience that English-speaking learners, if not all foreigners, find the old PARLER, FINIR, RECEVOIR, and VENDRE classification to be more simple. The new approach is given for reference, or to drive home the old.

All new verbs formed from nouns, etc., end in **ER** : **Téléphoner,** *to telephone.*

TABLE OF CONJUGATION FOR REFERENCE

Pronoun	Present	Imperfect	Past definite	Future	Conditional	Present Subjunctive	Past Subjunctive
je	-e, -s	-ais	-ai, -s	-ai	-ais	-e	-se
tu	-es, -s	-ais	-as	-as	-ais	-es	-ses
il, elle	-e, -t, -d	-ait	-a, -t	-a	-ait	-e	-t
nous	-ons	-ions	-mes	-ons	-ions	-ions	-sions
vous	-ez	-iez	-tes	-ez	-iez	-iez	-siez
ils, elles	-ent	-aient	-rent	-ont	-aient	-ent	-sent

Infinitives : **-er, -ir, -re.** Present Participles . **-ant.** Past Participles : **-é, -i, -u, -s, -t.**

LESSON 9

Auxiliary Verbs and Verbs in -er, -ir, and -oir

HAVING considered the basis of French verbs and how they are used, including the methods of conjugation, one can proceed to the basically important auxiliary verbs Avoir and Être. This is followed by model conjugations for all verbs ending in **-er** and also models for those ending in **-ir** and **-oir** with various irregular forms.

The Auxiliary Verbs

The two verbs **Avoir** and **Être** are called AUXILIARIES, because they are used not only to express TO HAVE and TO BE, but also to form *compound tenses of all verbs*. Hence, they are of paramount importance. They are *both irregular*.

INFINITIVE **AVOIR**, *to have*
PRESENT PARTICIPLE **ayant**, *having*
PAST PARTICIPLE **eu**, *had*

PRESENT TENSE	PAST TENSE
j'ai, *I have*	**j'ai eu**, *I have had* or *I had*
tu **as**, *thou hast*	tu as eu
il **a**, elle **a**, *he has, she has*	il a eu, elle a eu
nous **avons**, *we have*	nous avons eu
vous **avez**, *you have*	vous avez eu
ils, elles, **ont**, *they have*	ils, elles, ont eu

FUTURE TENSE
j'aurai, *I shall have*
tu auras
il, elle aura
nous aurons
vous aurez
ils, elles auront

Tu is used only where great familiarity exists between the persons speaking. **Vous** is the general word for *you*.

INFINITIVE **ÊTRE**, *to be*
PRESENT PARTICIPLE **étant**, *being*
PAST PARTICIPLE **été**, *been*

PRESENT TENSE	PAST TENSE
je **suis**, *I am*	j'ai **été**, *I have been* or *I was*
tu **es**, *thou art*	tu as été
il, elle **est**, *he, she is*	il a été
nous **sommes**, *we are*	nous avons été
vous **êtes**, *you are*	vous avez été
ils, elles **sont**, *they are*	ils, elles ont été

FUTURE TENSE
je **serai**, *I shall be*
tu **seras**
il **sera**
nous **serons**
vous **serez**
ils **seront**

Model for All Verbs Ending in -ER

PARLER, *to speak*

PRESENT PARTICIPLE	PAST PARTICIPLE
parlant	parlé

PRESENT TENSE	PAST TENSE
je parle, *I speak*	j'ai parlé, *I spoke*
tu parles	tu as parlé
il parle	il a parlé
nour parlons	nous avons parlé
vous parlez	vous avez parlé
ils parlent (-ent *always silent*)	ils ont parlé

FUTURE TENSE
je parlerai, *I shall speak*
tu parleras
il parlera
nous parlerons
vous parlerez
ils parleront

Only two verbs ending in **-er** are conjugated differently from **parler** :

ALLER, *to go* — PARTICIPLES, **allant**, **allé**

PRESENT TENSE	FUTURE TENSE
je **vais**	j'**irai**
tu **vas**	tu **iras**
il **va**	il **ira**
nous allons	nous **irons**
vous allez	vous **irez**
ils **vont**	ils **iront**

ENVOYER, *to send*
FUTURE j'**enverrai**, etc. (otherwise regular).

In the pages which follow, the essential parts of verbs will be stated as in the order of **PARLER** : the INFINITIVE, the PARTICIPLES, the PRESENT and FUTURE TENSES.

Model for Verbs Ending in -IR

FINIR, *to finish*

PRESENT PARTICIPLE :	PAST PARTICIPLE
finissant	fini
PRESENT TENSE	PAST TENSE
je finis, *I finish*	j'ai fini, *I finished*
tu **finis**	tu as fini, etc.
il finit	
nous **finissons**	FUTURE TENSE
vous **finissez**	je fini**rai**
ils **finissent** (-**ent** *always silent*)	tu fini**ras**, etc.

A number of verbs ending in **-ir** do **not** follow exactly the model of **finir**, and of these the following should be known

COURIR, *to run* — **courant**, **couru**
je cours, etc. — je **courrai**, etc.

DORMIR, *to sleep* — dormant, dormi
je **dors**, etc. — je dormirai, etc

MENTIR, *to tell lies* — **mentant**, menti
je **mens**, etc — je mentirai, etc

PARTIR, *to start, to set out* conjugate like **mentir**.

It is important to note that all verbs of motion are conjugated with **être** and NOT **avoir**. **Je suis parti**, *I have gone*

SENTIR, *to feel* : conjugate like **mentir**

SERVIR, *to serve* conjugate like **mentir**

MOURIR, *to die* — mourant, **mort**
je **meurs**, tu **meurs**, il **meurt**
nous mourons, vous mourez, ils **meurent**
je mourrai, etc

OUVRIR, *to open* — ouvrant, ouvert
j'ouvre, etc., j'ouvrirai, etc.

COUVRIR, *to cover* : conjugate like **ouvrir**

OFFRIR, *to offer* : conjugate like **ouvrir**

SOUFFRIR, *to suffer* . conjugate like **ouvrir**

SORTIR, *to go out*
je sors, tu **sors**, il **sort**
nous sortons, vous sortez, ils sortent
Otherwise like **mentir**

VENIR, *to come* — venant, venu
je **viens,** tu **viens,** il **vient**
nous venons, vous venez, ils **viennent**
je **viendrai,** etc
je **suis venu,** *I have come*

TENIR, *to hold* : conjugate like **venir**

VÊTIR, *to clothe* — vêtant, vêtu
je **vêts,** tu **vêts,** il **vêt**
nous vêtons, vous vêtez, ils vêtent
je vêtirai, etc

Model for Verbs Ending in -OIR

RECEVOIR, *to receive*

PARTICIPLES recevant, **reçu**

PRESENT TENSE	PAST TENSE
je **reçois,** *I receive*	j'ai reçu, etc.
tu **reçois**	
ils **reçoit**	
nous recevons	FUTURE TENSE
vous recevez	je recevrai
ils **reçoivent** (**ent** *always silent*)	tu recevras, etc.

A number of verbs ending in **-oir** do not follow exactly the model of **recevoir,** and of these the following should be known :

DEVOIR, *to owe, to have to* — devant **dû**
je **dois,** tu **dois,** il **doit**
nous devons, vous devez, ils **doivent**
je devrai, etc

FALLOIR, *to be necessary* — PAST PARTICIPLE **fallu**
il **faut,** *it is necessary*
il **faudra,** *it will be necessary*

PLEUVOIR, *to rain* — pleuvant, **plu**
il **pleut**
il pleuvra

POUVOIR, *to be able* — pouvant, **pu**
je **puis,** tu **puis,** il **peut**
nous pouvons, vous pouvez, ils **peuvent**
But : je **ne peux pas,** tu **ne peux pas,** etc (PRES. TENSE)
je **pourrai,** etc

SAVOIR, *to know* — **sachant, su**
je **sais,** tu **sais,** il **sait**
nous savons, vous savez, ils savent
je **saurai,** etc

VALOIR, *to be worth* — valant, valu
je **vaux,** tu **vaux,** il **vaut**
nous valons, vous valez, ils valent
je **vaudrai,** etc.

VOIR, *to see* — voyant, **vu**
je vois, tu vois, il voit
nous voyons, vous voyez, ils voient
je **verrai,** etc

VOULOIR, *to be willing* — voulons, voulu
je **veux,** tu **veux,** il **veut**
nous voulons, vous voulez, ils **veulent**
je voudrai, etc

As the model conjugations are learnt, the tenses should be compared with those set out in the Table of Conjugations in page 686. It will be found that in this way every part of a verb can be found in a short time.

LESSON 10

Verbs in -re and Special Uses

In this Lesson are completed the sets of model conjugations. These are for verbs ending in **-re** and their irregular forms and also for reflexive and impersonal verbs, and notes are added on the negative, interrogative, imperative, and passive. In the Lesson that follows is given an extensive vocabulary of essential verbs,—the conjugations of which should be studied on the lines of this and the preceding Lesson.

Model for Verbs Ending in -RE

VENDRE, *to sell*

PARTICIPLES : **vendant,** vendu

PRESENT TENSE	FUTURE TENSE
je vends, *I sell*	je **vendrai**
tu vends	tu vendras
il vend	il vendra
nous vendons	nous vendrons
vous vendez	vous vendrez
ils vendent (**ent** *always silent*)	ils vendront

j'ai vendu, *I sold*

The following **Irregular** verbs ending in **-re** should be known :

BOIRE, *to drink* — buvant, **bu**
je bois, etc
je boirai

CONNAÎTRE, *to be acquainted with* — connaissant, connu
je **connais,** etc.
je connaîtrai, etc.

CONDUIRE, *to conduct, lead* — conduisant, **conduit**
je conduis . . nous conduisons
je conduirai, etc.

CRAINDRE, *to fear* — craignant, **craint**
je **crains,** tu **crains,** il **craint**
nous craignons, vous craignez, ils **craignent**
je craindrai, etc.

CROIRE, *to believe* — croyant, **cru**
je crois, etc.
je croirai, etc

CUIRE, *to cook* : conjugate like **conduire**

DIRE, *to say, to tell* — disant, **dit**
je dis, tu dis, il dit
nous disons, vous **dites,** ils disent
je dirai etc

ECRIRE, *to write* — écrivant, **écrit**
j'écris, etc
j'écrirai, etc

FAIRE, *to make, to do, to cause to* — faisant, **fait**
je fais, tu fais, il fait
nous faisons, vous **faites,** ils **font**
je **ferai** etc

LIRE, *to read* — lisant, **lu**
je lis, etc
je lirai, etc.

METTRE, *to put* — mettant, **mis**
je **mets,** etc.
je mettrai, etc

PARAÎTRE, *to appear* : conjugate like **connaître**

PLAIRE, *to please* — plaisant, **plu**
je plais, tu plait, il **plaît**
nous plaisons, vous plaisez, ils plaisent
je plairai, etc.

PRENDRE, *to take* — **prenant, pris**
je prends, tu prends, il prend
nous **prenons,** vous **prenez,** ils **prennent**
je prendrai, etc.

RIRE, *to laugh* — riant, **ri**
je ris, tu ris, il rit
nous rions, vous riez, ils rient
je rirai, etc.

ROMPRE, *to break*
Regular, excepting **il** or **elle rompt,** *he* or *she breaks*

SUFFIRE, *to suffice* — suffisant, suffi
je suffis, tu suffis, il suffit
nous suffisons, vous suffisez, ils suffisent
je suffirai, etc.

SUIVRE, *to follow* — suivant, suivi
je **suis,** tu **suis,** il **suit**
nous suivons, vous suivez, ils suivent

SE TAIRE, *to be silent* : conjugate **taire** like **plaire**
(See below for REFLEXIVE VERBS)

VIVRE, *to live* — vivant, **vécu**
je **vis,** tu **vis,** ils **vit**
nous vivons, vous vivez, ils vivent
je vivrai, etc.

Model for Reflexive Verbs, or verbs which express an action performed and suffered by the subject, or which are conjugated with two pronouns instead of one :

SE LAVER, *to wash oneself*
PARTICIPLES : se lavant, s'être lavé

PRESENT TENSE	PAST TENSE
je **me** lave, *I wash myself*	je **me suis** lavé, *I washed myself*
tu te laves	tu t'es lavé
il se lave	il s'est lavé
nous **nous** lavons	nous **nous sommes** lavés
vous **vous** lavez	vous **vous êtes** lavés
ils **se** lavent	ils **se sont** lavés

FUTURE TENSE
je **me** laverai, etc.

NOTE All reflexive verbs are conjugated with the auxiliary Être. No exception to this rule.

The verb **S'ASSEOIR,** *to sit down* is conjugated as follows

PRESENT je m'assieds, tu t'assieds, etc.
PARTICIPLE s'asseyant, s'être assis
FUTURE je m'assiérai, etc.

The Negative of Verbs

This is expressed by placing **ne** before the verb and **pas** after : **Je ne parle pas,** *I do not speak.* **Je ne suis pas,** *I am not.* Used with the past Participle thus : **Je n'ai pas parlé.** In the Infinitive **ne** and **pas** both come before : **ne pas faire,** *not to do* : **ne pas lire,** *not to read,* etc.

The following negatives should also be known :

ne . . plus, *no more, no longer*
ne . . jamais, *never*
ne . . personne, *nobody*
ne . . rien, *nothing*
ne . . pas encore, *not yet*

They are all used SIMILARLY TO **ne . . pas** **Il n'y a plus de vin dans la bouteille.**
Note also that **ne . . . que** means *only* :
Elle ne voit que la lune.

To Use the Verb Interrogatively

To use a verb in this way, that is, *to ask a question,* in simple sentences, the verb is placed first and the pronoun afterwards—the reverse of a *direct* statement :

Vous parlez, *You speak*
Parlez-vous ? *Do you speak, are you speaking?*
Comprenez-vous ? *Do you understand?*

For the sake of euphony it is necessary to place a **t** between the verb and the pronoun, *when the verb ends in a vowel* : **A-t-il ?** *Has he ?* **Aura-t-elle ?** *Will she have ?*

And when the *first person singular* ends with **e** mute, an **acute** accent ´ is placed over it in the interrogative form : **Donné-je ?** *Do I give?* etc.

A most useful interrogative is the phrase **est-ce que,** followed by the direct statement :

Est-ce que vous allez à la gare ? *Are you going to the station ?*

Est-ce que vous chantez ? *Are you singing ?*

In *negative-interrogative* phrases the order is : **ne,** *verb, pronoun,* **pas :**

Ne parlons-nous pas ? *Do we not speak ?*

The Imperative, or How to Give Commands. Use the second person plural of the Present Tense : **Parlez !** *Speak !*

And in the Negative : **Ne parlez pas.** *Do not speak.*

Impersonal Verbs

PLEUVOIR, *to rain*
Il pleut, *it is raining.* **Il a plu,** *it rained*
Il pleuvra, or **Il va pleuvoir,** *it will rain*

FALLOIR, *to be necessary*
Il faut, *it is necessary*
Il faudra, *it will be necessary.* **Il a fallu,** *it was*

Y AVOIR, *there* . *to be*
Il y a, *there is* or *there are*[1]
Il y aura, *there will be*
Il y a eu, *there has been*

[1] Also means *ago.* **Il y a un an,** *a year ago.*

And note the phrase : **IL S'AGIT DE** followed by an Infinitive : *the question is, the matter is*

Il s'agit d'apprendre bien tout ce qui est écrit ici, *It is a matter of learning well all that is written here*

AVOIR is used in the following PHRASES EXPRESSING SENSATION, etc. :

avoir froid, *to be cold*
,, **chaud,** *to be hot*
,, **faim,** *to be hungry*
,, **soif,** *to be thirsty*
,, **raison,** *to be right*
,, **tort,** *to be wrong*
,, **sommeil,** *to be sleepy*
,, **peur de,** *to be afraid of*
,, **honte de,** *to be ashamed of*
,, **envie de,** *to be inclined to*

In stating age : **J'ai dix ans,** *I am ten years old.* **Quel âge a-t-elle ? Elle a vingt ans.**

Also **J'ai mal à la tête,** *I have a headache.*

The simplest and commonest way of forming the *passive* is by using **on** with **avoir** and the *past participle* of the verb of which the Passive is required. Thus, translate *I was told,* **On m'a dit** (*One has told me*), etc. **On** is greatly used : **On dit que,** *It is said that, they say that,* etc.

Most Infinitives make verbal nouns, thus : **Le boire,** *the drinking* ; **le manger,** *eating* ; **le parler,** *speech, manner of speaking.*

LESSON 11

A Vocabulary of Essential Verbs

MANY thousands of French verbs resemble their English equivalents but for the endings peculiar to French. These can quickly be learnt.

The lists which follow should be mastered, and each verb conjugated in accordance with its model, depending upon the ending of the Infinitive.

Section 1. VERBS SIMILAR IN FORM OR USAGE IN FRENCH AND ENGLISH

Ending in -ER

accepter, *to accept*
arriver, *to arrive* (être)[1]
aider, *to aid, assist*
améliorer, *to improve*
accompagner, *to accompany*

amuser, *to amuse*
abandonner, *to abandon*
avancer, *to be fast* (watch, clock), also *to advance*
augmenter, *to augment, increase*

briller, *to shine*

commencer, *to begin*
continuer, *to continue*
chanter, *to chant, sing*
changer, *to change*
comparer, *to compare*
contrôler, *to control, check*
compter, *to count*
commander, *to command, order*

conseiller, *to give counsel, advise*
copier, *to copy*
consoler, *to console, comfort*
chasser, *to hunt, chase*
charger, *to load*
cesser (de), *to cease (from)*
citer, *to cite, quote, mention*
célébrer, *to celebrate*

demander, *to demand, ask*
danser, *to dance*
dîner, *to dine*
désirer, *to desire, wish*
discuter, *to discuss, debate*
se disputer, *to dispute, quarrel*
déclarer, *to declare*
développer, *to develop*
détacher, *to detach, undo, untie*

déranger, *to disturb*
dégoûter, *to disgust*
détester, *to detest, hate*
durer, *to endure, last*
décider (de), *to decide upon*
débarquer, *to disembark, land*
détailler, *to detail, detach*
déplacer, *to displace*
déterminer, *to determine, decide*

étonner, *to astonish*
s'excuser, *to excuse oneself*
entrer, *to enter* (être)[1]
étudier, *to study*
essayer, *to attempt, try*
expliquer, *to explain*

enregistrer, *to register*
exiger, *to exact*
employer, *to employ*
économiser, *to save*
embarrasser, *to embarrass*

flatter, *to flatter*
fumer, *to smoke*

féliciter, *to congratulate*
forcer, *to force*

gagner, *to gain*

garder, *to guard, keep*

informer, *to inform*
inviter, *to invite*

interpréter, *to interpret*
imprimer, *to print*

juger, *to judge*

limiter, *to limit*

se marier, *to marry, get married*

monter, *to mount, go up* (être)[1]

nommer, *to name, nominate*

numéroter, *to number* (in order)

porter, *to carry*
payer, *to pay*
préférer, *to prefer*
passer, *to pass,* also *to spend time*

persuader, *to persuade*
planter, *to plant*
profiter, *to profit*
présenter, *to present, introduce*

refuser, *to refuse*
retourner, *to return*
rencontrer, *to encounter, meet*
regretter, *to regret*
rester, *to remain* (être)[1]
répéter, *to repeat*
se reposer, *to rest*
raconter, *to relate, tell*

réparer, *to repair*
réserver, *to reserve*
respirer, *to breathe*
raisonner, *to reason*
recommander, *to recommend, register a letter*
retarder, *to be or make late, slow* (watch, clock)
résulter, *to follow as a result*

séparer, *to separate*
se séparer (de), *to part company (with)*

sembler, *to seem*
signer, *to sign*

téléphoner, *to telephone*
terminer, *to terminate, end*
traverser, *to traverse, cross*
toucher, *to touch*

tourner, *to turn, to move round*
transporter, *to transport*

user, *to use, wear out*

visiter, *to visit*
varier, *to vary, change*

voyager, *to travel*
vouer, *to vow*

Ending in -IR

avertir, *to warn*

choisir, *to choose*
couvrir, *to cover*

convenir, *to be convenient, to suit*
contenir, *to contain*

découvrir, *to discover*
désobéir, *to disobey*

dormir, *to sleep*
démolir, *to demolish*

s'endormir, *to fall asleep*

finir, *to finish*

nourrir, *to nourish, feed*

obtenir, *to obtain*
ouvrir, *to open*

offrir, *to offer*
obéir, *to obey*

punir, *to punish*
partir,[1] *to depart, go away*

polir, *to polish*

retenir, *to retain, hold back*

se repentir, *to repent*

sentir, *to feel*
servir, *to serve*
se servir de, *to make use of*

souffrir, *to suffer*
se souvenir de, *to remember*

unir, *to unite, join together*

Ending in -OIR

recevoir, *to receive*

Ending in -RE

admettre, *to admit*

apparaître, *to put in an appearance*

[1] All *VERBS of MOTION* and their compounds are conjugated with **être**. Never forget this rule. **Je suis arrivé,** *I have arrived, etc.*

Section 1. VERBS SIMILAR IN FORM OR USAGE IN FRENCH AND ENGLISH *(continued)*

battre, *to beat*
se battre (à), *to fight*
joindre, *to join*

convaincre, *to convince*
conduire, *to conduct, lead*
comprendre, *to understand*
permettre, *to permit*
promettre, *to promise*
paraître, *to appear*

déduire, *to deduct*
descendre,[1] *to descend, to take down*
détruire, *to destroy*
défendre, *to defend,* also *prohibit*
disparaître, *to disappear*
répondre, *to reply*
suffire, *to suffice*
réduire, *to reduce*
surprendre, *to surprise*

[1] All *VERBS of MOTION* and their compounds are conjugated with être.

Section VERBS WHICH DIFFER IN THE TWO LANGUAGES

Ending in -ER

ajouter, *to add*
apporter, *to fetch, bring*
acheter, *to buy*
appeler, *to call*
aller, *to go*
s'en aller, *to go out, away*
allumer, *to light*
aimer, *to love*
amener, *to lead, bring*

briser, *to break, crack*
baigner, *to bathe, bath*
baisser, *to lower, fall, go down*
brûler, *to burn*
blesser, *to wound*
bercer, *to rock, lull, delude*

couper, *to cut*
chercher, *to seek, look for*
coûter, *to cost*
cacher, *to hide*
se chausser, *to put on one's shoes*
se coiffer, *to do one's hair, to wear a hat*
chauffer, *to warm*
casser, *to smash, break*
constater, *to prove, establish, testify*
cheminer, *to walk, go, proceed*
couler, *to flow, glide, slip*

donner, *to give*
demeurer, *to live, dwell*
dépenser, *to spend* (money)
déshabiller, *to undress*
déchirer, *to tear*
diriger, *to direct, guide*
se dépêcher, *to make haste, to be quick*
déjeuner, *to have breakfast, to lunch*

s'écrier, *to cry out, yell, exclaim*
écouter, *to listen*
épeler, *to spell*
envoyer, *to send*
emballer, *to pack*
enseigner, *to teach*
s'emparer de, *to take hold of*
entourer, *to surround*
écraser, *to crush*
espérer, *to hope*
emprunter, *to borrow*
ennuyer, *to annoy*
emplir, *to fill*

fermer, *to shut*

grimper, *to climb*
goûter, *to taste, enjoy*
gêner, *to hinder, embarrass*
geler, *to freeze*

habiller, *to clothe*

jouer, *to play*
jeter, *to throw*

louer, *to let a house,* and also *to praise*
laver, *to wash*
lancer, *to throw, dart, toss*
laisser, *to let, allow*
lier, *to link, join*
lever, *to lift, raise, gather*

manger, *to eat*
montrer, *to show*
marcher, *to walk*
mener, *to lead, take, drive*
manquer, *to miss, be short of*
mêler, *to mix*
mouiller, *to wet, soak*

nettoyer, *to clean*
nager, *to swim*
neiger, *to snow*
nier, *to deny*

oublier, *to forget*
ôter, *to take off, remove*

prêter, *to lend*
se porter, *to be* (as regards health)
parler, *to speak*
penser, *to think*
plier, *to fold*
se passer de, *to do without*
partager, *to share, divide*
pleurer, *to weep*
pêcher, *to fish*
pencher, *to lean, stoop*

remercier, *to thank*
réveiller, *to awaken*
raccommoder, *to mend, repair*
rappeler, *to remind* (someone else)
se rappeler de, *to remember*
raser, *to shave*
railler, *to make fun of*

semer, *to sow* (seeds)
souhaiter, *to wish someone something*
siffler, *to blow, whistle, hiss*
serrer, *to press*
sauter, *to jump*

tomber, *to fall*
trouver, *to find*
travailler, *to work*
tailler, *to cut*
tromper, *to deceive*
tousser, *to cough*
tuer, *to kill*
tirer, *to draw, pull, shoot*
tâcher, *to try, endeavour*

verser, *to pour out*
se vanter de, *to boast*
voler, *to fly* (also *to steal*)
vider, *to empty*

Ending in -IR

appartenir, *to belong to*
bâtir, *to build*
bouillir, *to boil*
courir, *to run*
devenir, *to become*
mourir, *to die* (être)
mentir, *to tell lies*
remplir, *to fill*
revenir, *to return* (être)
réussir, *to succeed*
sortir, *to go out* (être)
tenir, *to hold*
venir, *to come* (être)
venir de, *to have just* (done something)
vieillir, *to grow old*
vêtir, *to dress, clothe*

Ending in -OIR

avoir, *to have*
avoir lieu, *to take place*
s'asseoir, *to sit down*
devoir, *to owe, to have duty*
falloir, *to be necessary*
pleuvoir, *to rain*
pouvoir, *to be able*
savoir, *to know*
valoir, *to be worth*
voir, *to see*
vouloir, *to wish, to want*

Ending in -RE

attendre, *to wait*
apprendre, *to learn*
boire, *to drink*
connaître, *to know, be acquainted with*
croire, *to believe*
cuire, *to cook*
coudre, *to sew* (cloth, etc.)
craindre, *to fear*
défaire, *to undo*
dire, *to say, tell*
être, *to be*
écrire, *to write*
entreprendre, *to undertake*
entendre, *to hear*
faire, *to make, do, cause to*
faire mal, *to damage*
faire un pas, *to take a step* (*See* Idioms, page 697)
lire, *to read*
mettre, *to put*
mordre, *to bite*
naître, *to be born*
nuire, *to injure*
omettre, *to omit*
perdre, *to lose*
plaindre, *to pity*
se plaindre, *to complain*
peindre, *to paint*
prendre, *to take*
rendre, *to give back*
rire, *to laugh*
rompre, *to break*
suivre, *to follow*
sourire, *to smile*
se taire, *to be silent*
traduire, *to translate*
tordre, *to twist*
vivre, *to live*
vendre, *to sell*

LESSON 12

Exercises on Pronouns and Verbs

The student should now have sufficient knowledge to enable him to work out the meaning of the following sentences.

Mostly translations are omitted, and this gives the student an opportunity of practising thinking in French, getting the meaning rather than translating laboriously word by word. The matters presented are, in order: personal, interrogative, relative and demonstrative pronouns; possessive pronouns; negation, the value and uses of tenses; an important note on the subjunctive (the use of which is deliberately avoided as far as practicable); the past and present participles; impersonal and reflexive verbs; verbs in **-oir**, **-re** and **-ir**; and, to conclude, notes on the use of **il y a**, **y**, and **en**. Instruction on all these, except the last named, has already been given.

Pardon, avez-vous encore besoin de ce livre ?
Oui, je ne *l'*ai pas fini
Vous vous occupez de littérature, n'est-ce pas ?
Oui, je m'*en* occupe.
Étudiez-vous *le* français ?
Oui, je *l'*étudie.
Depuis combien de temps ?
***J'en* avais déjà fait à l'école ; mais je *l'*avais plus ou moins oublié.**
***L'*apprenez-vous tout seul ?**
Non, c'est M. Voisin qui *me l'*enseigne.
Tiens ! Il ne m'*en* avait pas parlé. *Que* vous fait-il faire ?

Il *me* corrige ma prononciation ; je *lui* demande des questions, il me *les* explique ; *nous* voyons ensemble différentes règles de grammaire, qu'il est difficile d'étudier *soi-même* ; nous passons plus de temps—cela va de soi—sur les points contraires à *mes* habitudes anglaises. Par exemple, j'ai toujours envie de dire : " il " est un homme, " elle " est une table au lieu de *c'est* un homme, *c'est* une table.

Parlez-*moi* de *vos* lectures.

Oh ! je ne lis pas encore des livres très difficiles. Mais certains *me* semblent faciles, les Contes de Maupassant, par exemple. *Les* connaissez vous ?

Bien sûr. D'ailleurs, Maupassant est un normand, comme *moi*. Et il parle de choses que je connais bien.

***Qui* est là ?**

C'est *moi*, Charles.

Entre. Qu'est-ce que *tu* fais dehors si tard ? *Je* venais prendre de *tes* nouvelles.

Je vais mieux, merci. *Voici* les médicaments (medicines) **que je dois prendre ; *ils* ont très mauvais goût.**

***À quoi* le docteur attribue-t-il *ta* maladie ?**

Les docteurs ne sont pas toujours bavards ; *le mien* n'a rien dit, il a écrit une ordonnance (prescription), ***dont* je n'ai pas pu lire un seul mot.**

Est-ce *votre* chapeau ?

Non. N'est-ce pas le *votre* ?

Non, le *mien* est brun. Quelqu'un a dû *le* prendre et oublier *le sien* par erreur.

Regardez bien parmi *ceux* qui sont ici ; *celui-ci* par exemple, ou *celui-là* ?

Merci, ne vous dérangez pas. *Ce* chapeau paraît *m'*aller (seems to fit me). **Je *le* prends.**

Les soieries (silks) ***que* l'on fabrique à Lyon sont très belles. La vigne** (vine) ***que* j'ai plantée a poussé** (has grown) **beaucoup cette année.**

Sont-ce là les livres *dont* vous m'avez parlé ?

***À quoi* fait-on allusion dans ce discours ?**

***Lequel de* vos deux amis avez-vous invité ce soir ?**

Voici l'agent *auquel* il faut vous adresser.

***Qui* avez-vous demandé ? *Que* dites-vous ?**

***Quoi ? Qu'est-ce que* vous dites ? *Ce* téléphone ne fonctionne pas bien ; je n'entends pas *ce que* vous dites.**

***Quelle* chance** (luck) **de vous rencontrer ici !**

***Qu'est-ce qu'*il y a ?—Ce n'est rien, *c'est moi* qui viens de faire tomber une tasse.**

***Qui est-ce qui* vous a répondu au téléphone ?**

***Qui* est-ce ? C'est le facteur** (postman), **Madame, *il* est en bas. C'est aujourd'hui le 1er janvier et *il* demande ses étrennes** (Christmas box).

C'est bizarre, je croyais avoir laissé mon livre sur la table. Quelle heure est-il ? *Il* est presque 4 heures.

POSSESSIVE PRONOUNS

The possessive pronouns take the gender and number of the noun which follows them : hence it is impossible to distinguish between *her* hat and *his* hat (both are **son chapeau**) unless you say : **son chapeau à lui, son chapeau à elle.** The same remark applies to the English *it*, which has no equivalent in French. Study these points in the following sentences.

C'est *mon* chapeau neuf ; il me va bien, n'est-ce pas ? (It's probably a lady speaking !). **Pour jouer au golf, je mets toujours *mon* vieux chapeau.** (Now, it's probably a man). **Regardez *sa* robe, comme elle est laide !** (It must be a woman's, since men do not wear " **robes** " in France). **M. Dupont parle de *son* ami Henri, et Mme Dupont parle de *son* amie Juliette. Depuis *son* divorce, elle a *sa* maison *à elle*. Elle a *son* chapeau sur la tête** (the pronoun " **elle** " makes it clear).

***Il* est tard, je vais me coucher. Donnez-*la* moi. Quoi ?—La montre que vous m'avez prise. Je viens de *le* lire. Quoi ?—L'article du journal dont vous m'aviez parlé. J'ai fini ma lettre, maintenant je vais *la* mettre à la poste ; est-*ce* loin d'ici ?**

NEGATION

Aimez-vous ça (cela) ? *Non.*
Do you like that ? No.

Non, non, **vous dis-je ; je** *n'***en veux** *pas,* **je** *ne* **l'aime** *pas.*
No, no, I tell you , I don't want it, and I don't like it.

Me promettez-vous de *n'***en** *rien* **dire ?**
Can you promise me not to say anything about it ?

Je *ne* **le dirai à** *personne* **;** *nul ne* **le saura.**
I won't speak about it to anybody ; no one will know.

Je *n'***ai vu** *ni* **lui** *ni* **Jean.**
I saw neither him nor John.

Redundant **NE** used in **que** sentences i.e. sentences in which **ne** does not introduce a negation

Evitez qu'on *ne* **vous entende en parler.**
Avoid being heard talking about it

Partez avant qu'il *n'***arrive.**
Go before he arrives .

Je crains qu'il *ne* **vienne** (compare **Je crains qu'il** *ne* **vienne pas**).
I am afraid he'll come (compare I am afraid he won't come)

Ce livre est plus intéressant que je *ne* **le croyais.**
This book is more interesting than I thought

Voila plus d'un mois que je *ne* **les ai vus.**
It is more than a month since I saw them.

VALUE OF TENSES

Notes de voyage **Le soleil** *se lève* (Present) **et** *entre* (Present) **peu à peu dans ma chambre. Ou** *suis-je* (Present) **? Je ne** *connais* (Present) **pas ces rideaux, cette table, ce lit. Ah !** *c'est* (Present) **vrai : je** *suis* (Present) **à Paris. Je** *suis arrivé* (Past Part) **hier, vers 5 heures. Quel voyage !**

Je *quittai* (Past Defin) **Londres vers 10 heures du matin ; comme il** *faisait* (Imp) **de la brume, il ne me** *fut* (Past Defin.) **pas possible de** *voir* (Inf) **le paysage avant Newhaven ; en** *arrivant* (Pres. Part) **au port, le soleil** *apparut* (Past Defin) **tout a coup, encore rouge, dans un ciel qui** *devenait* (Imp) **plus bleu de minute en minute.**

Malgré tout, la mer *était* (Imp) **agitée, et le bateau** *dansa* (Past Defin.) **pendant presque toute la traversée. Beaucoup de voyageurs** *furent* (Past Def) **malades, et je ne** *valais* (Imp) **pas beaucoup mieux moi-même quand nous** *arrivâmes* (Past Def) **à Dieppe.**

Un marin me *promit* (Past Def) **cependant que le temps** *allait* (Imp) *se mettre* **au beau, et, en effet, le ciel** *était* (Imp) **clair quand je** *montai* (Past Def) **dans le train. Le voyage** *s'annonçait* (Imp) **bien.**

Le train *partit* (Past Def) **lentement,** *traversa* (Past Def.) **la ville au pas (** at walking pace), **puis** *prit* (Past Def) **peu à peu de la vitesse. N'***ayant* **jamais** *vu* (Past Part) **la campagne normande, mon attention** *fut* (Past Def) **naturellement attirée par les champs, les jardins plantés de pommiers, et les petits villages avec leur église au toit pointu.**

Le pays *changea* (Past Def) **après Gisors, les maisons** *se firent* (Past Def) **de plus en plus nombreuses, pour** *se grouper* (Inf) **petit à petit en rues et en places. Nous** *traversons* (Pr) **la Seine, et nous voici arrivés.**

Comme *c'était* (Imp) **la première fois que je** *venais* (Imp) **à Paris, je** *pris* (Past Def) **un taxi. Si j'***étais* (Imp) **riche, je me** *promènerais* (Condit.) **toujours ainsi :** *c'est* (Pr) **si agréable. Peut-être** *deviendrai-je* (Fut) **riche un jour, qui** *sait* ? (Pr.)

A peine le taxi *avait-***il** *quitté* (Pluperfect) **la gare que j'***eus* (Past Def) **une émotion : car je** *croyais* (Imp) **que nous** *étions* (Imp.) **sur le mauvais côté de la rue. Mais en France les voitures** *vont* (Pr.) **à droite. Il** *faut* (Pr) *s'y habituer* (Inf.) **quoique ce ne** *soit* (Subj.) **pas là une grande difficulté.**

Je n'*ai* **naturellement pas** *pu* (Past Part) *voir* (Inf.) **grand chose pendant cette première soirée, quoique je me** *sois* (Subj.) **promené après dîner sur les Boulevards. Je** *suis rentré* (Past Part) **d'assez bonne heure, et me voici maintenant prêt à** *commencer* (Inf.) **mon exploration par les bords de la Seine :** *allons-y* (Imperat.) !

The progressive form in English : I am doing, *can be represented by the Present Indicative in French* **je fais,** *or for emphasis by the idiom* **je suis en train de faire.**

Qu'est-ce que vous *faites* **ici à cette heure-ci ?**
Je suis *en train de* **rentrer ces plantes, les nuits sont froides maintenant.**
What are you doing here at this time of night ?
I am bringing these plants inside, the nights are cold now

Voila dix ans que je *vais* **a l'eglise le dimanche.**
I have been going to church every Sunday for ten years.

Le facteur lui apporta une lettre alors qu'il se *rasait* [1]
The postman brought him a letter as he was shaving

Je suis en train d'écrire, ne me dérangez pas.
I am writing now, do not disturb me.

" **Ma chère amie, Je vous** *écris* **d'un endroit charmant, près de Z .**"
" My dear (Lady) friend, I am writing to you from a charming spot, near Z ."

Nous *irons* **à la mer cet été, pendant que vous irez à la montagne.**
We shall be going to the seaside this summer, while you'll be going to the mountains.

Il se coupa le doigt alors qu'il était en train de tailler son crayon.
He cut his finger while (he was) sharpening his pencil.

Il pleut ; il neige ; il vente ; il fait un temps à ne pas mettre un chien dehors ! Il fait un froid de canard !
It's raining , it's snowing , it's blowing a gale ; it's not fit for a dog to be out on a day like this ! Fine weather (cold) for ducks !

NOTE ON THE SUBJUNCTIVE

It has not been possible to do away entirely with the Subjunctive in this Course, although it has been avoided whenever possible. Here are a few ways showing how this can be done :

Il faut que j'*aille* **Il me faut aller.**

Croyez-vous qu'ils *ont* **necessaire de . . . – Croyez-vous à la nécessité de . . .**

Il vaudrait mieux que vous *veniez* **ici – Votre présence ici serait désirable.**

Je ne crois pas qu'il *vienne* **maintenant A cette heure-ci, sa venue m'étonnerait fort.**

Craignez-vous qu'il ne *vienne* **Craignez-vous de le voir venir ?**

Il semble que cela *puisse* **se faire facilement – Il paraît possible de faire cela facilement.**

Ne désirez-vous pas qu'il *soit* **heureux ? – Ne désirez-vous pas le voir heureux ?**

Je ne permets pas que vous y *alliez* **Je ne saurais vous permettre d'y aller.**

Faut-il qu'il *soit* **stupide pour fair ça ! = Faut-il être stupide pour faire ça !**

Pourvu que vous *arriviez* **de bonne heure nous prendrons un apéritif ensemble Si vous arrivez de bonne heure nous pourrons prendre un apéritif ensemble.**

[1] The Imperfect plays, in the Past, the same role as the Present *Cf.* also the role of the future in "*irons*" farther down

NOTE.—In practice, it would be enough to know the Subjunctive forms of **être** (*que je sois*, etc.) **avoir** (*que j'aie*, etc.) and **faire** (*que je fasse*, etc.). These forms would then combine with infinitives and adjectives, allowing for variety in style and introducing useful and common idioms. But, and this is the point which should be stressed, it is possible to write normal French *without* the Subjunctive: *the whole of "Conversation" and the "Gulliver" extract given later have been translated without using it once.*

PAST PARTICIPLE

Jean est *venu*. **Marie est** *venue*. **Ils sont** *venus* **tous deux.**

Ces fleurs sont merveilleusement *colorées*.

Ces rois se sont *succédé* **de père en fils pendant 300 ans.**

J'ai *écrit* **une lettre, en effet : mais ce n'est pas hier que je** *l'ai écrite* (object preceding verb), **c'est avant-hier.**

J'ai *vu* **vos amis : je** *les* **ai** *salués*.

Quelles fautes avez-vous *faites* **dans cet exercice ?**

Que d'ennuis cette règle stupide m'a *causés* !

PRESENT PARTICIPLE

Étant **arrivé trop tard, je n'ai vu que la moitié du spectacle.**

Le ministre entra en *saluant* **très bas, puis,** *prenant* **dans sa serviette** (portfolio) **un document, il en donna lecture au Roi.**

Sa visite n'*ayant* **aucun résultat, il alla voir un autre ami.**

Allant, venant, courant, travaillant **sans cesse, la fourmi** (ant) **a vite amassé de quoi vivre pendant l'hiver.**

IMPERSONAL VERBS AND IDIOMS

Il est **avantageux de savoir plusieurs langues.**

De quoi *s'agit-il* ? **Qu'y** *a-t-il* ? *Il se passe* **ici quelque chose de bizarre.**

Il ne faut pas **y aller avant demain matin.**

Il **me** *faudra* **10 boîtes de conserves pour la fin de la semaine.**

Il pleut, il tonne, il fait **un temps affreux :** *il fait* **noir,** *il fait* **du vent,** *il ne faut pas* **sortir par un temps pareil.**

Il est question **de faire une nouvelle route ;** *il faut dire* **que l'ancienne était trop étroite.**

Il n'est pire sourd que celui qui ne veut pas entendre.

Il **lui** *a fallu* **rendre compte de toutes ses dépenses.**

REFLEXIVE VERBS

Je *me* **lave les dents matin et soir. Le dentiste** *m'a* **habitué à cela, et je** *m'en* **trouve très bien.**

Ne *vous* **asseyez pas sur cette chaise, elle n'est pas solide.**

Il *se* **regarde dans la glace : il** *se* **critique, il** *se* **juge, il** *se* **déteste. Il ne** *se* **passe pas de jours qu'il ne** *se* **désole d'avoir le nez trop long.**

Nous *nous* **sommes bien amusés au bord de la mer cet été ; nous** *nous* **sommes baignés tous les jours ; et vous, M. Dupont,** *vous* **êtes-vous reposé à votre maison de campagne ?**

Tu *te* **trompes, je crois, le soleil ne** *se* **lève pas si tôt en cette saison.**

Je vous prie de *vous* **dépêcher pour ne pas faire attendre le taxi.**

Il se faut entraider, c'est la loi de nature (La Fontaine). S'est-elle réveillée de bonne heure aujourd'hui ?

Dites-vous bien qu'on peut *se* **tromper ; ne** *vous* **fiez pas** (do not rely on) **à un jugement trop rapide.**

Je ne *me* **sens pas bien : je** *me* **suis couché tard hier, je crois que je vais aller** *me* **reposer ; je** *m'***excuse de vous quitter ainsi.**

VERBS IN -OIR

The forms given in brackets are the infinitives corresponding to each verb. Grammars and dictionaries always take the infinitive as a basis for classification.

Je reçois (*recevoir*) **mes amis aujourd'hui ; nous verrons** (*voir*) **s'ils sont exacts au rendezvous. Il faut** (*falloir*) **me dépêcher, si je ne veux** (*vouloir*) **pas être en retard ; voyez-vous** (*voir*) **cette table là-bas ?**

Voudriez-vous (*vouloir*) **la mettre près de la fenêtre ? Pourrons-nous** (*pouvoir*) **nous asseoir tous autour ?**

Nos invités devraient (*devoir*) **être là maintenant ; ah ! voilà Jean ! Eh bien, n'avez-vous pas vu** (*voir*) **les autres ? - Non, mais comme il pleut** (*pleuvoir*) **ils ont dû** (*devoir*) **s'abriter quelque part en route. Il ne peuvent** (*pouvoir*) **tarder maintenant.**

VERBS IN -RE

Je connais (*connaître*) **un restaurant sur le Boulevard, qui vous plaira** (*plaire*) **certainement. C'est un de mes amis qui m'y a conduit** (*conduire*) **; et il paraît** (*paraître*) **s'y connaître. Je crois** (*croire*) **que nous ferions** (*faire*) **mieux de prendre un taxi ; je crains** (*craindre*) **qu'il ne se mette** (*mettre*) **à pleuvoir.**

Nous y voilà : oui, une table à deux nous suffira (*suffire*). **Prendrez-vous** (*prendre*) **un apéritif ? Suivons** (*suivre*) **les conseils du garçon. Voyons, ne croyez-vous** (*croire*) **pas qu'une omelette cuite** (*cuire*) **à point, suivie** (*suivre*) **d'un de ces "** *plats du jour*, **" ferait** (*faire*) **notre affaire ?**

Et pour que nous ne rompions (*rompre*) **pas avec les bonnes habitudes, apportez-nous, garçon, une bouteille de Bourgogne. Vivre d'abord, philosopher ensuite ; je ne sais plus qui a dit** (*dire*) **ça ; mais c'était un grand homme. Buvons** (*boire*) **à sa santé !**

VERBS IN -IR

En ouvrant (*ouvrir*) **mon journal, je vois qu'il y a courses à Auteuil cet après-midi. Je sors** (*sortir*) **donc mon habit gris et mes jumelles[1] et me voilà parti** (*partir*). **L'autobus doit partir à 1 heure ; je vais l'attendre dans un café où l'on me sert** (*servir*) **un vin blanc.**

Je rencontre un ami et je lui dis : " Viens (*venir*) **avec moi." Nous partons ensemble pour le champ de courses. Le cheval que je choisis** (*choisir*) **est un des favoris ; mais, quoiqu'il ait bien couru** (*courir*), **il n'arrive que second.**

[1] field-glasses

IL Y A

Il y a **deux ans que vous êtes à Paris.**
You have been in Paris for two years.

Y a-t-il **déjà si longtemps ?**
Have I been there so long ?

Il **pouvait** *y avoir* **là deux mille personnes.**
There might have been 2,000 people there.

Il y avait **une fois un Roi et une Reine qui . . .**
Once upon a time there was a King and Queen who . . .

Il n'y a pas **moyen de vous recevoir avant six heures.**
You cannot be received before six (i.e. there is no way of receiving you).

Croyez-vous qu'*il y aura* **beaucoup de monde ?**
Do you think there will be many people there ?

Y (= à cette place, dans ce but)

Allez-vous au cinéma ? Oui, j'*y* **vais.**
Y **pensez-vous encore, après un an ?**
Pour *y* **voir, mettez des lunettes.**
Irez-vous en Bretagne ? Oui, j'*y* **ai une petite maison.**

EN (= de là, de cela, de lui, de cette place)

Avez-vous des cigarettes ? Oui, j'*en* **ai.**
Ces fruits sont excellents. Mangez-*en* **donc.**
Etes-vous allé à Paris cette année ? Oui, j'*en* **viens.**
Voilà une heure que j'attends ! J'*en* **ai assez !**
J'*en* **veux une autre comme celle-ci, s'il vous plaît.**

AVOIR instead of **ETRE**

Il neige ; j'*ai* très *froid*.—Pour *avoir chaud*, mettez donc des gants.—Vous *avez raison*, malheureusement j'*ai* peur de les avoir perdus.

J'ai honte d'*avoir sommeil* ainsi ; mais je me suis couché tard hier. Je n'*ai* vraiment pas *envie* de jouer aux cartes ce soir. Mais si vous *avez soif*, servez-vous, le porto est sur cette petite table ; vous *auriez tort* de faire des façons. Faites comme chez vous.

Use of **ON**

***On dit* que l'hiver sera très froid : c'est très malheureux. *On sait*, en effet, que les pauvres en souffrent beaucoup. *On a fait* ce qu'*on a pu* pour eux, mais ce n'est pas assez ; *on n'a pas* réussi à réunir assez d'argent, malgré tous les efforts.**

Beaucoup devront se passer du nécessaire, ce qui est vraiment terrible. *On ne fera* jamais trop pour le bien de l'humanité.

LESSON 13

Adverbs, Prepositions, and Conjunctions

In this short Lesson new ground is broken. Necessarily adverbs, prepositions, and conjunctions have been used in sentences for exercises and other purposes ; here we present brief rules for their uses.

An Adverb is a word used to qualify a verb, adjective or another adverb.

The general rule is that adverbs are formed by *adding* **-ment** to the *feminine of adjectives*, or to the masculine, when this ends in a vowel.

ADJECTIVE : **courageux, courageuse,** *courageous*
ADVERB : **courageusement,** *courageously*
ADJECTIVE : **heureux, heureuse,** *happy*
ADVERB : **heureusement,** *happily*

Adjectives ending in **-ant, -ent,** form adverbs in **-aMMent, -eMMent :**
obligeant, obligeaMMent.
In French this ending **-ment** corresponds to the English *-ly*.

The *position of the adverb* is *after* a simple verb or the auxiliary in compound tenses :

Vous avez bien parlé, *You have spoken well*
Il le fait souvent, *He does it often.*
Bien, *well* ; **toujours,** *ever, always* ; **trop,** *too much*, precede the infinitive, while all other adverbs follow it
Il a peur de trop parler. Il a parlé haut.

COMPARISON : **PLUS—plus courageux,** *more courageous* **Le PLUS le plus courageux,** *most courageous.*

VOCABULARY OF ADVERBS

ainsi, *thus*
aussi, *also*
bien, *well*
fort, *very*
mal, *badly*
même, *even*
assez, *enough*
autant, *as much, many*
beaucoup,[1] *much*
environ, *about*
moins, *less*
très, *very*
ailleurs, *elsewhere*
auprès, *near*
peu, *little*
plus, *more*
presque, *almost*
si, *so*
tant, *so much*
trop, *too much*
contre, *against*
dedans, *inside*
dehors, *outside*
derrière, *behind*
dessous, *underneath*
dessus, *on, over*
devant, *before*
en, *from there, thence*
ici, *here*
là, *there*
loin, *far*
où, *where* (distinguish **ou,** *or*)
partout, *everywhere*
y, *there*
en arrière, *behind*
en avant, *forward*
en bas, *below*
alors, *then*
aujourd'hui, *to-day*
aussitôt, *immediately*
bientôt, *soon*
pourtant, *yet, although*
cependant, *however*
demain, *to-morrow*
après-demain, *day after to-morrow*
déjà, *already*
depuis, *since*
encore, *still, yet, again*
enfin, *at last*
hier, *yesterday*
avant-hier, *day before yesterday*
jamais, *ever*
maintenant, *now*
parfois, *at times*
puis, *then, afterwards*
quand, *when*
quelquefois, *sometimes*
souvent, *often*
tard, *late*
tôt, *soon*
toujours, *always*
tout à coup, *suddenly*
de jour, *by day*
de nuit, *by night*
à temps, *in time*
en retard, *behind time*
combien ? *how much ?*
comment ? *how ?*
où ? *where ?*
pourquoi ? *why ?*
quand ? *when ?*
d'où ? *whence, from where ?*
non, *no*
oui, *yes*
si, *yes* (in reply to a negative question)
vraiment, *truly*
sans doute, *without doubt*
peut-être, *perhaps*
probablement, *probably*

[1]Never say or write "*Très beaucoup.*"

PREPOSITIONS, CONJUNCTIONS, AND INTERJECTIONS

These are invariable words of which the usage corresponds to the English. A list is given below. The words in this list are of great importance. Some of them are the most frequently recurring words in the language.

One should learn the use of the Prepositions **en, dans,** and **à** (meaning *in*) *before proper names*. This is simple :

1 In the case of *feminine country* names use **en,** without the article.
2 With *masculine country* names use **au, à l'**.
3 With *towns and small islands* use **à** only (without article).
4 With *masculine or feminine country* names *qualified by some phrase*, use **dans le, la, l'**.

Thus : 1 **En Chine, en Amérique, en France.**
2 **Au Maroc, au Portugal,** etc.
3 **À Paris, à Londres, à Jersey.**
4 **Dans l'Amérique du Sud, dans la Chine du Nord.**

VOCABULARIES

1. PREPOSITIONS

à, *at, in*
après, *after*
avant, *before*
dans, *in*
de, *of, from*
depuis, *since*
en, *in*
entre, *between*
environ, *about*
jusque, *to, until*
pendant, *during*
vers, *towards*
avec, *with*
chez, *at the house of*
parmi, *among*
sous, *under*
sur, *on*
voici, *here is . . .*

Note also : **Dans un mois** means *at the end of a month*, while **en un mois** means *in the space of a month*

voilà, *there is . . .*
à côté de, *beside*
au-dessous de, *under*
au-dessus de, *over*
au lieu de, *instead of*
en face de, *opposite*
loin de, *far from*
près de, *near*
excepté, *excepting*
malgré, *in spite of*

par, *by*
sans, *without*
selon, *according to*
à cause de, *on account of*
pour, *for*
à travers, *through*

2. CONJUNCTIONS

car, *for, because*
comme, *as*
donc, *then*
et, *and*
mais, *but*
ni, *neither, nor*
ou, either, *or*
quand, *when*
que, *that*
si, *if*
puisque, *since*
quoique, bien que, *although* (subjunctive)
aussitôt que, *as soon as*
de manière que, *so that*
parce que, *because*

3. INTERJECTIONS

Attention ! *Pay attention !*
Tenez ! *Really !*
Bis ! *Again ! Encore*
Bon ! bien ! très bien ! *Good ! Well done !*
Assez ! *Enough !*
Paix ! *Silence !*
Gare ! *Out of the way ! Look out !*
Pas possible ! *You don't say so !*
Comment ! *How ! Why !*
Parbleu ! *Of course !*
Allons donc ! *Tell that to the marines !*
Vrai ! *Really !*
A la bonne heure ! *Excellent !*
Sapristi ! *Good heavens !*

4. MISCELLANEOUS

seulement, *only*
guère, *scarcely*
de bonne heure, *early*
à droite, *to the right*
à gauche, *to the left*
tout droit, *straight ahead*
à haute voix, *in a loud voice*
grâce à, *thanks to*
en même temps, *at the same time*
s'il vous plaît, *please*
aimé de tous, *loved by all*
boire dans un verre, *drink* out of *a glass*
la femme aux cheveux gris, *the woman* with *grey hair*
pas à pas, mot à mot, *step by step, word by word*
en train de, *in course of, in the act of*
merci, *thanks, no thanks*
Je vous remercie, *thank you*

5. GREETINGS

Bonjour, *Good day, good morning*
Bonsoir, *Good evening*
Bonne nuit, *Good night*
Comment allez-vous ? *How are you ?*

LESSON 14

Word Building

FRENCH, like other languages, has the means within itself of enlarging its vocabulary by virtue of word building. From the point of view of the beginner, it is at the same time a difficulty and an encouragement. A difficulty, because the *root* form on which the language builds is sometimes obscured—though never to a great extent—by vowel changes or more frequently consonantal changes ; and an encouragement, because of the wide vocabulary which rapidly comes within the bounds of comprehension.

When the Grammar and the essential or "root" vocabulary (already given) are known, and the principles of word-formation outlined here understood, the meaning of thousands of words will appear at once, or at any rate can be conjectured with fair certainty. Many of these new words will be found in the French exercises and texts, and the more difficult are explained.

The Four Ways of Word Building

There are, for practical purposes, four ways of making new words :

1 The same "form" can be used in different parts of speech **Boire,** *to drink,* **LE boire,** *drinking* ; **sage,** *wise,* **LE sage,** *the wise,* etc
2 By adding a suffix or ending, e.g. **raison,** *reason,* **raisonNER,** TO *reason,* **raisonneMENT,** *reason*ING, **raisonnABLE,** *reason*ABLE, **raisonNEUR,** *arguer, reason*ER
3 By a prefix : **faire,** *to do,* **REfaire,** *to do* AGAIN, **DEfaire,** *to* UN*do,* **SURfaire,** *to* OVER*do,* **PARfaire,** *to complete,* etc
4 By putting together two or more independent words : **aigre-doux** , from **aigre,** *bitter,* and **doux,** *sweet.*

Prefixes Used in Word Building

M (im, il, ir)	*Negation*	**possible, IMpossible** **lisible, ILlisible** **religieux, IRreligieux**
RE	*again*	**venir, revenir**
CONTRE	*against*	**poison, contrepoison**
EX (es, é)	*out of*	**patrie, expatrier** **souffle, essouffler**
MI	*half*	**août, mi-août**
SUR	*over*	**voler, survoler**
SOU, SUB	*under*	**mettre, soumettre**

Suffixes Used in Word Building

(a) To form NOUNS :

-et, -ette	*diminutive*	**garçon, garçonnet** **fille, fillette**
-able	*agent*	**compter, comptable**
-age	*action*	**laver, lavage**
-eur	*agent*	**voyager, voyageur**
-aison, -ation	*action*	**livrer, livraison** **administrer, administration**
-at	*profession*	**professer, professorat**
-ee	*fullness*	**bouche, bouchée**
-ier	*profession*	**ferme, fermier**
-ier	*fullness*	**sucre, sucrier**

(b) To form ADJECTIVES

-ible	**paix, paisible**
-able	**durer, durable**
-ois, -ais	**France, Français** **Hongrie, Hongrois**
-el	**mort, mortel**
-iste	**social, socialiste**[1]
-é (the Past Participle ending)	**limite, limité**

[1] This ending often used to form nouns as well, e.g. **un socialiste, un artiste,** etc

(c) To form VERBS :

-er	*to telephone*	**téléphoner**
	to shunt	**shunter**

Compounds

Of these there are four principal kinds :

1 TWO NOUNS : **chou-fleur,** *cauliflower,* **timbre-poste,** *postage stamp*
2 NOUN + ADJECTIVE : **rouge-gorge,** *red-breast*
3 ADJECTIVE + ADJECTIVE . **petit-gris,** *squirrel*
4 VERB + NOUN or ADJECTIVE : **perce-neige,** *snowdrop* **gagne-petit,** *knife-grinder*

IDIOMS

An idiom is an expression peculiar to a language. The number of idioms in French is

almost infinite, and there are many excellent lists of them available. For the practical purposes of a traveller what is given below should suffice for a beginning—but only for a beginning.

Que voulez-vous dire ?	*What do you mean ?*
Qu'est-ce qu'il y a ?	*What is the matter ?*
Qu'est-ce qu'il a ?	*What is the matter with him ?*
Il y a une heure que je suis ici	*For one hour I have been here*
Il n'y a pas de quoi	*Don't mention it*
Quel temps fait-il ce soir ?	*How is the weather this evening ?*
Il fait { **chaud**	*It is hot*
Il fait { **froid**	*It is cold*
Avoir { **faim**	*To be* { *hungry*
Avoir { **soif**	*To be* { *thirsty*
Avoir { **chaud**	*To be* { *hot*
Avoir { **froid**	*To be* { *cold*
Combien de temps faut-il pour aller de Londres à Paris ?	*How long does it take to go from London to Paris ?*
Cette maison est à moi	*This house is mine*
Avoir mal à	*To have a pain in*
J'ai mal aux dents	*I have toothache*
J'ai mal au cœur	*I am not very well*
Elle est à plaindre	*She is to be pitied*
Il est à croire que	*It is probable that*
Me voici	*Here I am !*
Le voilà	*There he is !*
Le combien sommes-nous ?	*What is the date ?*
Il me faut (followed by	
Il vous faut infinitive)	*I must, you must,* etc.
Je dois	
Vous devez	
Veuillez (followed by infinitive)	*Please*
S'il vous plaît	*If you please*
Merci	*Thanks ;* also *No thanks*
Être médecin, soldat, etc.	*To be* A *doctor,* A *soldier,* etc.
Comme il faut	*Correct : as should be*
Un homme comme il faut	*A respectable man*
Faites cela comme il faut	*Do that properly*
Avez-vous tout ce qu'il vous faut ?	*Have you everything you want ?*
Payer (une bouteille)	*To pay* FOR (*a bottle*, etc.)
Être à même de	*To be capable of, up to,* etc. (flying to Australia, etc.)
Compter (followed by infinitive)	*To rely upon* (doing something)
Où en êtes-vous ?	*How far have you got ?*
Quoi qu'il en soit	*Whatever the case may be*
Ça y est !	*That's it ! It's all right !*
J'y suis !	*I understand*
Faire -	
Cela ne fait rien	*That doesn't* MATTER
Faire une visite	PAY *a visit*
Faire un discours	DELIVER *a speech*
Faire plaisir à, de la peine, mal	GIVE *pleasure to, displease, to harm*
Faire 100 kilomètres	TO COVER 100 *kilometres* (in a car, etc.)
Faire des affaires avec	*To do business with*
Faire venir	*To send for, to fetch*

CORRESPONDENCE IN FRENCH

THE DATE is written thus : **le 1er janvier 1933, le 31 décembre 1934.**

A FORMAL OPENING : **Monsieur, Madame, Mademoiselle.**

A MODERATELY FAMILIAR OPENING : **Cher Monsieur, Chère Madame, Chère Mademoiselle.**

A FAMILIAR OPENING : **Mon cher Dupont, Mon cher Georges.**

A FORMAL ENDING : **Veuillez agréer, Monsieur, l'expression de mes sentiments distingués.**

A MODERATELY FAMILIAR ENDING : **Croyez en mes sentiments distingués.**

A FAMILIAR ENDING : **Croyez en mes meilleurs souvenirs,** or : **Tout à vous,** *yours ever.*

LESSON 15

Conversation and Reading

THE student who has mastered the material so far provided should now have sufficient grammar and words to enable him to read French, with little difficulty beyond that experienced when he meets new words. New words should be looked up in a dictionary, and added to the notebook which was recommended at the beginning of the course. This Lesson should be regarded as *a test of knowledge.*

If the student feels that he can fully understand nearly all of the conversations and of the reading extracts, he can consider that good progress has been made. If not, there is only one thing to do. GO OVER THE COURSE AGAIN, paying particular attention to the parts not known. **It is inadvisable to proceed to general reading until one is quite satisfied with the results of this test reading.**

Dans un Grand Magasin

Monsieur X. : Ah, vous voilà ! Est-ce que je suis en retard ? Je suis d'abord entré par la porte de côté.

Une amie : Seulement une ou deux minutes. Ce n'est rien à Paris.

M. X. : Je me remets entre vos mains complètement, car je n'ai aucune idée des prix en France. Et d'ailleurs je suis toujours un peu perdu dans ces grands magasins.

Amie : Alors laissez-moi être votre guide ce matin. De quoi avez-vous besoin ?

M. X. : D'abord des articles de toilette ; c'est la première chose sur ma liste. J'ai été assez stupide pour partir sans ça.

Amie : Nous y voilà : c'est à notre gauche en entrant.

M. X. : Combien ces éponges ?[1]

Demoiselle de magasin : Il y en a à plusieurs prix, selon leur taille, à partir de 10 francs.

M. X. : Bien. Combien celle-ci, de taille moyenne ?

Demoiselle de M. : 20 francs, Monsieur.

M. X. : Je la prends. C'est un article solide, n'est-ce pas ?

[1] **éponge** *sponge. Notice that many English words in sp-, st-, sc-, correspond to French words in ép-, ét-, éc-, cf.* school *and* **école**, *stage and* **étage**, *stuff* and **étoffe**, *etc.*

Dem. de M. : Certainement, Monsieur. Nos éponges sont de première qualité. Et avec ça ?

M. X. : Une brosse à dents, aussi dure que possible. Oui, celle-ci fera mon affaire. Et de la pâte dentifrice,[1] s'il vous plaît. Ce sera tout.

Dem. de M. : Trente-sept cinquante, Monsieur.

Amie : Et maintenant ?

M. X. : J'ai grand besoin de chaussures neuves.

Amie : Pour cela, il faut aller au rayon des articles d'hommes. C'est par ici.

Employé : Est-ce qu'on s'occupe de vous, Monsieur ?

M. X. : Non. Je voudrais voir des chaussures de ville.

Employé : En noir ou en brun ?

M. X. : En brun.

Employé : Combien chaussez-vous, Monsieur ?

M. X. : Je n'ai aucune idée des mesures françaises.

Employé : Je vais prendre votre pointure,[2] Monsieur. Vous chaussez du 41. Je vais voir ce que j'ai dans ce numéro. Voici une bonne chaussure, très forte. Elle peut aller aussi bien pour la ville que pour la campagne.

Amie : Essayez-les pour voir.

Employé : Comment vous sentez-vous dedans, Monsieur ?

M. X. : Mon pied gauche est un peu serré ici.

Employé : Je vais agrandir un peu la chaussure, c'est très simple.

M. X. : Et combien sont-elles ?

Employé : Cent dix francs, Monsieur.

Amie : C'est vraiment bon marché pour des chaussures de cette qualité. Je les prendrais, si j'étais de vous.

M. X. : Parfait. Mais n'oubliez pas d'agrandir celle de gauche.

Employé : Vous pouvez être tranquille, Monsieur, je vais m'en occuper. Voulez-vous les faire envoyer à votre adresse, ou les prenez-vous maintenant avec vous ?

M. X. : Faites-les envoyer chez moi. Je vais vous faire un chèque maintenant ; donnez-moi donc ma facture.

Amie : Si vous voulez vous faire envoyer d'autres choses à votre adresse, il vaudrait mieux vous faire faire une carte ; vous ferez un chèque pour la somme totale ; ne croyez-vous pas que ce serait plus simple ?

M. X. : Est-ce possible de faire ça ?

Employé : Mais oui, Monsieur. Je vais vous donner une carte d'acheteur. Voulez-vous une crême spéciale pour vos chaussures ? Nous en avons une à 12 francs la boîte— Cela conserve le cuir en bon état.

[1] pâte dentifrice = *tooth-paste. In the same way, many English words in final -st correspond to French words in* -ât-, ôt-, -êt-, *cf. forest and* forêt, *roast and* rôt, *disgust and* dégout, *etc.*

[2] pointure ; taille du pied.

M. X. : Non, merci. Je n'en ai pas besoin Et maintenant des chemises. Où est-ce ?

Employé : Au premier étage, Monsieur.

Amie : Nous y voici. Les chemises doivent être par ici.

M. X. : Je voudrais voir quelques chemises, s'il vous plaît.

Employé : En quelles couleurs, Monsieur ?

M. X. : Pour aller avec du gris.

Amie : Le bleu va bien avec le gris.

M. X. : Eh bien, montrez-moi ce que vous avez en bleu.

Employé : Quelle pointure de col, Monsieur ?

M. X. : Ah, j'en avais pris note la dernière fois que je suis venu à Paris. Une seconde, s'il vous plaît, que je regarde sur mon carnet. Voilà : je prends du 39.

Employé : Et vers quels prix, Monsieur ?

M. X. : Pas plus de cinquante francs.

Employé : Voici une très bonne chemise à quarante-neuf francs. C'est une nouveauté coton et soie.

M. X. : C'est très doux, n'est ce pas ? Oui, ce n'est pas mal du tout. Le bleu foncé est une bonne couleur.

Amie : Est-ce que ça lave bien ?

Employé : Oh, très bien, Madame. Et ça garde la couleur.

M. X. : Et les faux-cols ?

Employé : Il y en a deux qui vont avec la chemise.

M. X. : Bien

Amie : Mais cette chemise est sale. Voyez-vous ces marques là ? Est-ce qu'il n'y en aurait pas une autre de la même couleur ?

Employé : Non, Madame. C'est la dernière qui me reste en bleu foncé. Elle s'est sans doute trouvé salie dans le magasin. Je vous la laisserais pour quarante francs.

M. X. : Parfait. Puis-je acheter des gants ici ?

Employé : Oui Monsieur. Quelle sorte désirez-vous ?

M. X. : Des gants gris. En cuir lavable, si possible. Ma pointure doit être marquée à l'intérieur de ceux que j'ai sur moi.

Employé : Oui, près du bord. Voilà : numero 8. Je n'ai pas de cuir lavable en gris. Mais voici un gant qui se tient propre et qui est très chaud. Il est doublé en laine. C'est un article excellent.

M. X. : Que dites-vous ?

Amie : Il dit que ce sont les meilleurs gants qu'il a.

M. X. : (à son amie) Et vous, qu'en dites-vous ?

Amie : A mon avis, je crois que ces gants sont préférables à ceux en cuir lavable dont vous parliez.

M. X. : Parfait. Je les prends. J'ai une carte d'acheteur.

Employé : Désirez-vous autre chose ?

M. X. : Non.

Employé : Dans ce cas, si vous voulez bien me donner cette carte, je vais vous faire votre facture. Voici une plume pour signer votre chèque.

M. X. : Quand me ferez-vous envoyer tout ça ?

Employé : Vous le recevrez demain matin au plus tard, peut-être même ce soir.

M. X. : Ah, je vois qu'il y a un restaurant à cet étage. Accepterez-vous de prendre un café ou une glace avant d'aller au cinéma ?

Amie : Je ne saurais vous refuser.

M. X. : Voilà une table libre près de la fenêtre. Nous pourrons regarder dans la rue.

Amie : Oui, cela m'amuse toujours de voir les passants.

M. X.: Voici le garçon. Avez-vous des glaces?

Garçon : Oui, monsieur. Quel parfum ? Fraise, vanille, pistache, praliné . . .

Amie : Une glace pralinée.

Garçon : Bien, madame. Et monsieur ?

M. X. : Un café filtre. Voulez-vous fumer ?

Amie : Je ne fume que des cigarettes anglaises.

M. X. : Précisément : j'ai dans mon étui des "Passing Cloud."

Amie : Oh, merci. J'adore cette marque-là.

M. X. : Voici nos consommations. A quel cinéma voulez-vous aller ? Voici dans mon journal le programme des filmes qu l'on passe aujourd'hui.

Amie : J'aimerais à voir un filme de Sacha Guitry.

M. X. : En voilà un au Paramont. Mais Guitry joue également ce soir au Théâtre de la Madeleine dans une de ses dernières créations. Ne préférez-vous pas l'entendre lui-même ?

Amie : Oh, oui, car j'adore ce grand artiste.

M. X. : Alors j'irai vous prendre à huit heures. Ne voulez-vous pas une autre glace ?

Amie : Je vous remercie, mon ami.

M. X. : Garçon, l'addition.

LES VOYAGES DE GULLIVER

L'auteur nous parle de lui et de sa famille - pourquoi il se décide à voyager—destruction de son navire—il gagne à la nage les côtes de Lilliput—il est fait prisonnier, et est emmené à l'intérieur du pays.

MON père avait une petite propriété dans le Nottinghamshire ; j'étais le troisième de cinq fils. A l'âge de quatorze ans, on m'envoya à Emmanuel College à Cambridge, où je restai trois ans, étudiant mes livres avec zèle. Mais le coût de mes études, quoique peu élevé, était trop lourd pour mes parents, et je fus placé comme élève chez Mr. James Bates, dont le nom était fameux à Londres à cette époque. Je demeurai chez lui quatre ans et, grâce aux petites sommes d'argent que mon père m'envoyait de temps à autre, je pus apprendre l'art de diriger les bateaux, ainsi que les calculs nécessaires à ceux qui veulent partir pour de longs voyages ; car j'étais persuadé qu'un jour ou l'autre, j'irais chercher fortune sur mer.

Après avoir quitté Mr. Bates, je retournai chez mon père. Là, avec l'aide de ce dernier, de son frère et d'autres parents, je réunis quarante livres, et on me promit une somme de trente livres par an pour couvrir mes dépenses à Leyde. J'étudiai la médecine dans cette ville pendant deux ans et sept mois, étant certain que cela me servirait dans mes voyages.

Peu après mon retour de Leyde, grâce à l'appui de mon bon maître, Mr. Bates, je fus nommé médecin sur le *Swallow*, capitaine Abraham Pannell. Je restai trois ans et demi avec lui, faisant deux ou trois voyages dans le Levant et d'autres pays.

A MON retour, je décidai de me fixer à Londres, avec l'approbation de Mr. Bates, mon maître, qui dit du bien de moi à plusieurs de ses malades. Je louai donc un appartement dans une petite maison de Old Jewry, et comme on me conseillait de changer mon état, je pris pour femme Miss Mary Burton, deuxième fille de Mr. Edmund Burton, gros marchand de bas dans Newgate Street.

Malheureusement, mon bon maître Mr. Bates mourut deux ans plus tard, et comme je n'avais qu'un petit nombre d'amis, mes affaires allèrent de mal en pis ; car, étant un homme honnête, je ne voulais pas employer certaines façons de faire malheureusement trop communes chez beaucoup de médecins. Après avoir demandé conseil à Mary et quelques uns de mes amis, je pris la décision de reprendre la mer. Je fus tour à tour médecin sur deux navires, et fis de nombreux voyages pendant six ans, tant aux Indes orientales qu'occidentales, augmentant ainsi ma fortune.

Je passais mes heures de liberté à lire les meilleurs auteurs passés et présents, ayant toujours beaucoup de livres avec moi ; et, à terre, j'observais avec soin les habitudes et le caractère des peuples que je visitais, apprenant leur langue facilement, grâce à une mémoire très fidèle.

La dernière de ces traversées ne fut pas très heureuse, et, dégoûté de la mer, je voulus retrouver ma famille. Je quittai Old Jewry pour Fetter Lane, puis pour Wapping, espérant y trouver bon accueil parmi les marins, mais je ne pus y gagner ma vie. Après avoir espéré pendant trois ans que la fortune tournerait, j'acceptai une offre avantageuse de la part du capitaine William Pritchard, commandant l'*Antelope*, qui allait faire un voyage dans la mer du

Sud. Nous partîmes de Bristol le 4 mai, 1699, et notre voyage commença d'abord très bien.

Il est sans intérêt de fatiguer le lecteur par un rapport complet de nos aventures dans ces mers. En peu de mots, voici ce qui arriva : pendant notre passage aux Indes occidentales, nous fûmes surpris par un vent violent au nord-ouest de la Terre de Van Diemen. Selon nos observations, nous étions alors à 30 degrés 2 minutes de latitude Sud. Douze de nos hommes étaient morts des suites de la mauvaise nourriture et de la fatigue ; les autres ne valaient pas beaucoup mieux, étant très faibles.

Le 5 novembre, époque à laquelle le printemps commence dans ces pays, par un temps très brumeux, nos marins virent un immense rocher tout près du navire ; mais le vent était si fort, que nous allâmes droit dessus et que notre bateau se brisa aussitôt en deux. Six hommes, dont j'étais, réussirent à mettre le bateau de sauvetage à la mer, et à nous éloigner du navire et du rocher.

Après avoir fait, selon mes calculs, environ neuf milles, nous ne fûmes pas capables de continuer, faibles comme nous l'étions après les fatigues du bord. Nous nous abandonnâmes donc aux mouvements des vagues, et après une demi-heure environ, un coup de vent subit retourna notre petit bateau.

Ce fut la dernière fois que je vis mes camarades, ainsi que ceux qui étaient restés sur le rocher ou sur le navire, mais je suis certain qu'ils y trouvèrent tous la mort. Pour ma part, je me mis à nager à l'aventure, poussé par le vent et le courant, laissant souvent pendre mes jambes sans pouvoir toucher terre. Soudain, presque sans forces et incapable de continuer la lutte, je me rendis compte que je n'étais plus en eau profonde, et que le vent était tombé. La pente était si faible que je dus marcher pendant presque un mille avant d'atteindre la côte.

Je m'avançai alors dans l'intérieur du pays, sans rencontrer aucun signe de maisons ou d'habitants. Du moins, j'étais si faible, que je n'en vis aucun. Ma fatigue était grande ; de plus, le temps était lourd, et j'avais bu avant d'abandonner le navire un demi-litre de cognac, de sorte que je me sentis une forte envie de dormir. Je me couchai sur l'herbe, qui était très courte et très douce, et je ne me rappelle pas être jamais tombé dans un si profond sommeil.

Je pense avoir dormi environ neuf heures, car, à mon réveil, il faisait jour. J'essayai de me lever, mais je ne pus faire un mouvement. M'étant étendu sur le dos pour dormir, je me rendis compte que mes bras et mes jambes étaient fortement fixés au sol de chaque côté, et que mes cheveux, que j'avais longs et épais, étaient retenus de la même façon. De plus, un certain nombre de cordes fines passaient sur mon corps depuis le dessous des bras jusqu'au haut des jambes. Je ne pouvais regarder qu'en haut. Le soleil commençait à chauffer, et sa lumière me blessait les yeux.

D'étranges bruits venaient à mes oreilles ; mais, dans la position où j'étais, je ne pouvais rien voir sauf le ciel. Peu de temps après, je sentis quelque chose de vivant monter sur ma jambe gauche et arriver presque à la hauteur de mon menton.

Abaissant les yeux autant qu'il m'était possible, je vis que c'était un être à forme d'homme, qui n'avait pas plus de six pouces de haut, des armes à la main, et une longue boîte étroite sur le dos. En même temps il me semblait sentir au moins quarante de ces êtres, venant derrière le premier.

J'en fus grandement surpris, et poussai un tel cri qu'ils se sauvèrent tous de peur ; et certains, comme je le sus plus tard, se blessèrent même en sautant de mon corps sur le sol. Mais ils revinrent très rapidement ; et l'un d'eux, s'étant placé suffisamment près pour voir toute ma figure, leva les bras et les yeux en signe d'admiration extrême, criant d'une voix aigue et claire "*Hekinah degul.*"

HINTS FOR FURTHER STUDY

The first necessity is a good French-English Dictionary, and among the best are the *Shorter French and English Dictionary*, by J. E. Mansion, published by Harrap & Co., and the *Concise Oxford French Dictionary*, by A. and M. Chevalley (Oxford Press).

The *Basis and Essentials of French*, by Charles Duff and the *Basis and Essentials Reader*, by J.-P. Vinay, M.A., will be found helpful in elucidating many points.

Grammars. The student who wishes to perfect his knowledge of the grammar should obtain the Grammar of the French Academy (*Grammaire de L'Académie française*). The Dictionary and this grammar are the *only books really essential*, unless the student wishes to become a teacher of French, in which case Brachet's *Grammar* (Accidence and Syntax) might be used.

General Reading. There is so much that it is difficult to know what to recommend for a beginning. Perhaps the student could not do better than begin with a highly entertaining book, written in delightful French: *Candide*, by Voltaire—easily obtainable, and for which there are English translations.

A modern author who wrote very beautiful and straightforward French was Anatole France. Try his *La Rôtisserie de la Reine Pédauque* or his *L'Île des Pingouins*, for both of which English translations are available. One may then proceed to something more difficult, say *Les Misérables* or *Notre Dame*, by Victor Hugo ; and, in poetry, anything by Hugo.

The History of French Literature, by Edward Dowden, is an admirable introduction, as it, in the works of Professor Saintsbury, and in the *Short History of French Literature* by Geoffrey Brereton (Pelican) the interested student will find indications of the French authors most likely to suit his taste.

ENGLISH LITERATURE

LESSON 1

Literature and its Place in Life

EVERYONE realizes that it is necessary to take food in order to live. The proposition is as certainly, if not as quickly, demonstrable as the fact that fire burns, or that rain makes people wet. But there are other facts, quite as important to know and to understand, that cannot so easily be demonstrated. Among these is the fact that some knowledge of literature is essential to the living of a well-balanced life.

Many instances may be adduced which might seem to prove the opposite, so far as either side of the question is capable of proof. The Vanderbilts and the Rothschilds rose to great heights without any literary attainments ; the founder of the former family, it is said, could neither read nor write. Alas, with all his gains he remained poor ; and poor, indeed, are all who, however rich in worldly gear, still lack that imperishable furnishing of the mind which can be acquired only in communion with the great intellects that have made the world's literature

Mental Nourishment

Not poor merely, but intellectually dead As surely as the body dies for lack of food, or grows unhealthy by improper feeding, so does the mind of man languish and die if mental nourishment be withheld. Everyone has known persons of gross body who have been blessed with material wealth, but whose minds were vacant places where no beautiful things were, yet where these might have been if the impulse had come, the effort been made, at the proper time, towards literary culture.

Nevertheless it must not be thought that the reading of books is the be-all and end-all of mental culture. The simile of feeding may still be pursued. And just as there is over-development of the physical man—differently, but equally, by over-eating or excessive athleticism —it is no uncommon thing for a man to become attached to mere book-learning to the exclusion of many other essential elements of that culture which produces a well-balanced, foursquare life.

The Ministry of Literature

The purpose of this course of Lessons is not to praise book-learning unduly There are nobler things than to be rich in the lore of the world. Yet let a man be never so well endowed in all the attributes of good character, he will still be the better man by some measure of acquaintance with the treasures of literature ; in fact, it is hard to know how he may acquire the more worthy traits of character without the ministry of literature, direct or indirect. A man who has no knowledge of books has the blinds close drawn on some of the windows of his soul.

Only within comparatively modern times has a class arisen that makes literature the sum of its life : the professional literary class. In ancient times the authors were men of action—travellers, architects, statesmen. They did not begin and end in a world of books ; they fought battles, they adventured in strange lands, they governed provinces, they made laws, they raised buildings ; and what they wrote was in large part derived from their contact with the life of the world in which they participated, not as authors on the quest for " copy," but as men.

Only a Part of Life

The same is true, in a measure, of the monks, so long the conservators of letters. They were primarily concerned with the business of living and the contemplation of a future life. The literary man of our day is in constant danger of looking at life habitually from the " literary " point of view as distinct from that of human experience. His real success is to be measured mainly by his evidence of deliberate detachment from the conditions which have made it possible for so many members of the community to become professional critics of life rather than men waging the common battle of existence.

For the literary class, as such, these Lessons have nothing to offer. Their utility is for those in whose lives literature has an ennobling part to play, but still only a part -that is, for the majority of the people. Bacon's dictum remains unsurpassed :

> Read not to contradict or confute, not to believe and take for granted, nor to find talk and discourse, but to weigh and consider.

Virtues of Discretion

" To weigh and consider "—that is the true purpose of all useful reading ; not for the mere storing of our minds with multitudinous facts, nor yet with sensuous fancies, which seem to be the chief results of the tremendous consumption of contemporary printed matter. In truth, there is no reason to complain these days that the British public reads too little ; it reads quite enough, but with little discrimination. In order to " weigh and consider," it is obvious that there must be discretion.

At what age comes discretion ? Biography teems with stories of prodigies who had " read everything " at fifteen. Many of us have met in the flesh one of these wonders grown old, and have formed no exalted estimate of his literary judgement. By grace of genius a boy or girl of

nineteen may be a poet ; but the average healthy youth unvexed by genius is not usually at that age, and rarely earlier, capable of the most intelligent and profitable reading. He may have read much and derived genuine and rational pleasure from his reading, but it will be at a later stage that the critical faculty will assert itself and judicial appreciation of that early reading be disengaged from the vague sensations of remembered pleasure and repulsion left by the books read before the development of the faculty of criticism. No dogmatic assertion can be made as to the incidence of that faculty, but it is seldom present before the age of twenty ; whence it may be inferred that all the reading that matters in one's life is not done from sixteen to twenty-one or thereabouts.

Young Readers

The young people of sixteen who are "for ever reading something or other" are more than likely to become the least intelligent of readers, the least truly cultured. Not seldom do they acquire in later life a positive distaste for books ; and in any case the greater part of their juvenile reading will count for little or nothing since it was done at a time when their understanding was unequal to the occasion.

Younger children should be encouraged at most to acquire the habit of reading, but to that end the commonest of boys' or girls' papers will serve. Then by the time they reach fifteen or sixteen years of age they are in train for guidance, and one may reasonably presume to direct their attention to such standard works as will give pleasure while steadily fostering the taste for what is good and enduring in literature - though it would be foolish to expect from readers so young any well-founded judgement on the qualities of the books they read.

The True Purpose

One cannot picture those of tender years "weighing and considering" what they read. They have read as they have played with ball or skipping-rope—for pleasure ; and rightly so. But just as with the later 'teens these games are put behind them so then should reading be undertaken for a different purpose—the true purpose—the culture of the mind ; with crude results at first, no doubt, yet thrilling with the awakening knowledge that books are not merely inventions for passing the time, but among the most precious of all the agencies for carrying the mind to due maturity.

The True Pleasure

The purpose of art, it is sometimes said, is to please. But not all that pleases is art. Henry Drummond, as a boy, was in love with the red-painted inside of a toy trumpet, and wondered why God had not made the whole world red. Many a child has had the same delight and wonder in his earliest reading. Sexton Blake and Billy Bunter pleased innumerable thousands of healthy boys, but neither was a creation of literary art.

The true pleasure of art is that arising from the joy of consciously appreciating the work of the artist, and realizing that it has wrought enlargement in one's mind to the better understanding of the world and the people in it. That is the kind of pleasure which should come when the reader has begun to understand that he is reading seriously ; not until then has literature begun to take its place in his life.

The Reader's Contribution

But the reader must bring something to this reading of books if he would take something away. He must bring certain qualities of imagination, common sense, and sympathy, in addition to the elements of school-learning, in order that whatever he reads he may "weigh and consider." When he has done this, he may feel he has taken another step along the unending path of knowledge and self-culture. He will have his ordinary affairs to attend to ; his daily tasks in office or workshop, his studies in whatever subject his taste or circumstances may dictate, his recreations, his love-making. Reading from literary culture should not displace any of these essentials of manhood and womanhood.

Better than Bookworms

No sensible person would advocate the breeding of a race of mere bookworms any more than one composed only of virile specimens of bone and brawn with brain devoid of all grey matter. Yet even, say, the humblest fitter in an engineering shop is capable of enlarging and beautifying his life by a judicious knowledge of literature. Years ago there lived an engineer's labourer whose taste in books was as cultured and accurate as that of many who live by criticism, whose knowledge of the standard authors was extensive and sound, who could write with great literary charm (he contributed to the *Cornhill* and other magazines), and remained withal a sturdy British workingman.

For All Walks of Life

What is possible to one is open to many, and though one could not with equanimity contemplate the spectacle of numerous engineers' labourers bombarding the magazines with unsolicited contributions, one would rejoice to know that in the humblest walks of life as in the highest—and the need is equal in both—the pleasures of literature were rationally present.

It is to assist in realizing this ideal that the Lessons which follow are designed.

LESSON 2

How to Get the Best out of Books

No one is entitled to respect for his opinion on any book who has not read many books systematically. Most ordinary readers are totally unqualified to say whether a book is good or bad, for they have never developed the faculty of knowing how to judge. To aver that they like it or dislike it is another matter. They know what they like or dislike. Man Friday, in *Robinson Crusoe*, disliked salted food, but that did not prove salt a bad thing. The Papuans liked to make a meal of grandmothers, but British people have never considered this a toothsome dish. Many avid patrons of the circulating libraries are Papuans and Fridays, devouring with approval things that offend all regulated tastes, or spitting out the real salt of literature.

Emerson's Dubious Advice

In all matters of taste and opinion one must necessarily allow for the personal equation. Even when receiving the opinion of a man eminently entitled to an opinion, one ought to examine that opinion before acceptance, if only to cultivate in oneself the critical faculty. Consider, for example, this injunction of Emerson's : "Never read any book that is not a year old. Never read any but famed books. Never read any but what you like." Regarded from the point of view of the average man, this advice is useless. "Never read a book that is not a year old." That is the soundest part, but a truly good book may appear this day ; why wait a year before you bring your mind into touch with this new expression of a living mind ? A year, if you like, before asserting that the new book is literature, and will endure ; that is another matter, and possibly ten years is not long enough to estimate that !

Nor is the vogue of a new book a wholly bad thing. To read what all others are reading has at least the merit of vivifying one's interest, though sober criticism may not come until later—a year later, if you will, or ten years later. But deliberately to refrain from opening a book until it is a year old—no. Even the ephemeral in literature is not to be utterly despised ; Hazlitt's oft-quoted advice as to reading an old book whenever a new one comes out is not to be taken as undervaluing all new literature, but as wise counsel not to allow the new books to crowd out the old and tried favourites.

"Never read any but famed books." Dubious advice, since so much depends on what is meant by famed. *Don Quixote* is famed ; so are *Gargantua*, *Paradise Lost*, *Pendennis*. But so, also, are *The Robe* and *Murder at the Vicarage*—and these are more than a year old. And anyway, there is much that is worth reading in books that are not, and never will be, famed—even in poor and mediocre books.

As to "Never read any but what you like," that, too, is unwise counsel. Samuel Johnson said that "a man ought to read just as inclination leads him, for what he reads as a task will do him little good"—which is a different line of thought from Emerson's, however similar it may at first appear. As a matter of common experience, it is not the things we like that most stimulate our thoughts, but the things we dislike.

Reading What You Don't Like

The sheer pleasure of agreeing with another's thoughts tends for the time to lull the reader's own thinking faculty, whereas the man or the writer whose avowals disturb the reader's equanimity, ruffle his temper, strike him rudely, will energise his own thoughts ; rasp them, maybe, to smoothness and greater usefulness. It is conflict, not acquiescence, that produces activity, mental and physical ; and the authors one dislikes may have as much for one as, if not more than, those one likes. But—and here is the subtle difference between Emerson and Johnson—one's inclination may lead one to bear company with an author one dislikes, for the tonic effect of his opposing intellect. Once this paradox is realized, the reader may conclude that he is reading to some profit.

What should be remembered about the method of reading is that there are many different ways of getting the best out of a book, and that all are right. If the individual feels his own particular way to be right, it is right for him, though it might be the worst possible way for anyone else. The essential is that he should have a way—that he does not read aimlessly ; that if he should presume to utter an opinion on a book, he shall have deliberately come by that opinion as the result of reason and study, that it shall not be just the capricious expression of an irresponsible mind.

Reading with a Reason

The reader must not come empty-handed to the author. He should at least know the rudiments of grammar and composition. He should also bring some other quality, even if it be only a conscious ignorance of the subject of study. But more usually he takes up a book already knowing something of the matter with

which it deals, of the author's reputation, characteristics, previous works. Unless he is an aimless person, he has also a *reason* for taking up a book. That reason may be wise or mistaken; enough that it is a reason, that the reader is not merely bent on passing an idle hour.

There are, of course, numerous reasons for reading a book. Local interest will count for something; he is on safe ground who familiarises himself with all the notable writers identified with his own town or district. And it is well for the reader to have some one branch of literature, or even one author, that attracts him more than others, though never allowing this study to weaken his interest in general reading.

Gibbon had a system of self-examination before reading any book, whereby he took stock of his own knowledge of the subject, glancing over the work to secure a rough idea of its scope, before beginning seriously to study it. Thus he would know with precision how much the author had taught him when he had finished the reading of the book. John Morley tried this method and commended it. It is, at least, one that depends upon no personal idiosyncrasy, and is open to everyone

Value of Prefaces

Never "skip" a preface. It is unfair to the author, and foolish to yourself, to omit hearing what he has to say in his preface. A possible exception to this rule is offered by Scott's novels, which are over-burdened with prefaces and appendices. Most of these can be read with enjoyment, but they are hardly essential to the pleasure of the fiction; and if they were, then the fiction had surely failed of its purpose. But ordinarily a preface is as much a part of a book as a door is part of a house.

Having read carefully the preface or introduction—sometimes both are included and rarely, if it be a good book, without a reason - you begin the actual reading.

The reader has now to decide upon the qualities to observe in the work before him. These cannot be detailed in the present Lesson, but some working examples must be given, and these are taken from History and Fiction.

The Reading of History

In reading an historical work the following factors should be considered.

(1) The author's point of view. The more picturesque and readable an historian is, the more need is there to keep a sharp look-out for bias. Evidence of this will soon appear; and whenever it is suspected the reader should refer to some other historians on the same point in order to correct any false impressions.

(2) The author's knowledge of men and motives and great movements will call for examination nothing being taken for granted unless it be an obvious statement of uncoloured fact.

(3) His style will demand especial attention, as in an historian it is of equal importance with accuracy. Indeed, his manner will largely determine his accuracy—one who is excessively fond of picturesque description and epigrammatic comment (Macaulay, for instance) being always open to the suspicion of letting his manner unduly colour his matter.

The Reading of Fiction

In a work of fiction one looks for:

(1) A story. This is the first essential, and the reader has to ask himself whether or not it appeals to him as being an ingenious invention and credible.

(2) The sequence of the story Is it unfolded naturally, inevitably? Are the events contrived as in actual life they might be? Or are they forced to fit the ends of the author? All these questions may be answered in the negative, although the first consideration is fully admitted.

(3) Are the characters such as might exist in life, and do they act for just those reasons which would influence living people? Here, while (1) and (2) might be granted, (3) might be only partially allowed.

(4) The vital question of style, which includes humour, sympathy, method, personality, must be always, in some degree, present with the reader.

It happens often that the reading of one book leads to the reading of others through some mention of them in the work just laid down. Thus, in Boswell's voluminous Life of Johnson a host of other books are named, the reading of which will be rendered (at the beginning, at least) the more piquant from knowing what Johnson thought of them. To note carefully the books which are mentioned as having been favourites with a man whose life we admire, and to determine on a first-hand acquaintance with these, would be an excellent feature of any system which the reader may eventually evolve for himself.

When one has mastered the art of reading, he may be left to apply it to the best of his understanding. This may be said, however: that no reading of a book is complete until the reader has carefully reviewed the whole work in his mind, turned back to passages which may have puzzled him in the earlier parts and revised his first impressions in the light of his finished reading because the end of a book, and especially of a work of fiction, may modify the opinions formed in the earlier stages of its study.

A good plan, if the book just read happens to be the first of that author's with which the reader has made acquaintance, is to take up

some other of his writings, whether the first has pleased us or not. Indeed, if it has not pleased, it should be rather an incentive to further acquaintance, lest, on the strength of one book, an erroneous opinion be formed of the writer.

The task of reading in succession all the works of any one author is not to be commended, especially if he be as voluminous as Scott or Dickens. If the sequence be broken by turning to other writers, the serious reader will be the better able to compare their styles, and so to appreciate all with more precise justice.

LESSON 3

Poetry: Highest Form of Human Expression

Poetry is the first, as it is the highest, expression of the human mind. Of all forms of human expression it is the most natural and direct, and the heart of a people always responds to it in moments of exaltation. Even those who confess they are unable to read poetry cannot escape its influence; since there is in the nature of mankind the stuff of poetry, which must at times manifest itself in all our lives.

Elemental Nature of Poetry

Poetry is not merely the ingenious arrangement of words and phrases in lines beginning with capital letters and ending with words of similar sound; it is one of the elemental things of nature, like electricity, and perhaps, in its deeper significance, no better understood.

The Aeolian harp may be taken as an illustration. This stringed instrument of the ancients, placed where the wind could play upon it, gave forth sweet sounds. Man made the instrument, but nature produced the music; neither acted alone—it was a relation of interdependence.

So with poetry; it is not merely Homer or Dante, not Shakespeare or Milton, who plays upon the senses when one reads his poems. The poet offers the magical, emotion-fraught words, and the reader offers the listening heart; but it is the soul of all remembered emotions and aspirations in each one of us—the very rhythm of life—that attunes these words to the needs and possibilities of each individual nature, and thus applies poetry.

It was by first discovering the power to utter words potent to awaken responsive emotions in their fellows—having fitted first of all their own emotions, of which the words were an essential part—that men began that intercommunion of souls which, in the course of ages, creating for itself certain conventions of form, shaped itself finally into poetry.

The Bards of Old

In the earliest recorded history of Great Britain the bard has his place in the social scheme, articulating what his fellows felt dimly and were unable to body forth, and, interpreting his age to itself and posterity.

These old Gaelic singers were often warriors as well; but many of them were more akin in their social status to the modern professional men of letters than any poets or historians in the intervening ages. The need of singers to arouse enthusiasm for battle, to celebrate victories, to mourn over defeats and commemorate fallen heroes, was as great in those rude days of Fionn, Oisin, and Merlin as the need of the political pamphleteer and leader-writer of modern times; but the bard was more dignified, more in tune with nature.

Thus, in the British Isles, as some twelve centuries earlier in Greece, when Homer celebrated the Trojan war in the first great poem of imperishable genius, the beginning of poetry as a literary expression was associated with the hero and heroic deeds. In the ancient poetical books of the Bible it was associated with the divine aspirations of the soul. The real beginning of English poetry was also religious, much of the poetic energy of our race, first expressed by Caedmon in the 7th century, being informed by a deep devotional spirit, which has remained characteristic of English poetry through all successive ages.

Analysis of Poetry

The history of poetry will be the subject of succeeding Lessons. What will be of immediate practical use is a working knowledge of its constituents and varieties. This may be thought by some a wrong phrase to use, smacking as it does of the laboratory. True, it is tolerably certain that the greatest poets were almost unconscious of art, their exalted thoughts taking on an exalted and inevitable rhythm in perfect harmony with the canons of art, because it was above art and of a piece with that elemental voice of nature expressed in the well-known phrase from the Book of Job, "When the morning stars sang together." Nevertheless, it is possible to make a scientific analysis of poetry, no less than of any other energy of nature.

None of the varying criteria whereby men have attempted to define and judge the poet's art has quite met the case, and the criticism of poetry is to-day about as difficult to define as poetry itself. For criticism has changed as

persistently as art in its standards of taste, and to apply the standards of one age to the judgement of the art produced in another is shown by certain historical examples to be futile. It is the glory of Aristotle's system of criticism that so much of it may still be applied to modern art. But criticism usually works out thus: After so many principles have been re-examined, defined, and approved, some great new artist—a Walt Whitman, for instance—arrives and upsets all the theories.

One thing that does seem to be within the range of even timorous assertion is that rhythm and verse-form are the essential characteristics of poetry. Yet many eminent critics, Carlyle among them, have contended that prose can possess all the necessary qualities of poetry. It is commonly agreed, however, that though both poetry and prose have their rhythms, this metre is not mere ornament, but of the very fabric of the thought itself. In other words, the emotions or thought-material of the "inspired" poet have an inherent, rhythmic, metrical quality, which is not the mere literary decoration of the artist, but the very voice of nature herself. Rhyme, on the other hand, is purely ornamental, and not an essential of poetry, though so scholarly a critic as Dr. Johnson had a great distaste for blank verse, and Bernard Shaw once asserted that a cat might be taught to write it. Many would add that much of the free verse produced in recent years on both sides of the Atlantic would seem to be well within the feline capacity.

Poetry and Prose

Among the many writers on prosody who have sought to explain to the ordinary reader the significance of the difference between prose and poetry so that its largeness would be unmistakable, none would appear to have hit upon a better plan than that of an American professor, Mark H. Liddell, in his *Introduction to the Scientific Study of English Poetry*. While there is much in that work which does not compel assent, it does at least supply a good working test of the fundamentals of poetry. Professor Liddell takes this passage from *Macbeth* wherewith to test the qualities that render poetry distinct from prose:

> Duncan is in his grave:
> After life's fitful fever he sleeps well;
> Treason has done his worst: nor steel, nor poison,
> Malice domestic, foreign levy, nothing,
> Can touch him further.

This we will presume to be poetry. The professor re-casts the passage in what may be called literary or rhythmic prose:

> Duncan lies in his grave. Life, that racks my soul with succeeding ague-fits of fear, for him is over and he sleeps in peace beyond the reach of treason. The assassin's steel or poisoned cup, secretly fomented strife at home, treacherously assisted hostility from abroad—none of these can harm him now.

He next reduces it to a bald statement of fact, as follows:

> The life of Duncan is extinct, and he is no longer affected by the personal vicissitudes and dangers of government, such as assassination, treason, rebellion, and foreign invasion, which produces this anxiety in my mind.

First Stage: Plain Prose

Liddell then proceeds to examine these three forms of the same thought. The last (which, for this experiment, may be regarded as the first form of the thought) is, he considers, so plain and dispassionate a statement of the fact that it would hardly awaken any strong emotions in the breast of anyone save Macbeth himself. It is not poetry. But the second is framed in words charged with emotional qualities, which must necessarily affect the feelings of all readers, though not invariably touching them to the same issues.

Second Stage: Rhythmic Prose

The added quality in the second stage is denoted as human interest, and Liddell rightly considers this the determining element of literature, that common and general interest, which its thought possesses for all men who think, regardless of those peculiar attitudes toward life that arise from peculiar pursuits and occupations—a doctor, for instance, not looking on death in the same way as a non-medical man or woman, nor an undertaker finding in the word "grave" the same emotions as one to whom the surroundings of the tomb are less familiar. Still, the second stage is not recognizable as a poetic form.

Third Stage: Poetry

But in the third stage (or, properly, the Shakespearean form first printed) the thought material is, both in substance and in form, in warp and woof, as it were, poetical. The change is due chiefly to the regular rhythm and the metrical movement of the verse, which punctuate the thought; marking off its different impulses, its units, and projecting vividly into the mind of the reader what was in the mind of Macbeth—not, let us note, merely what was in the mind of Shakespeare, for this is an instance of what Watts-Dunton calls absolute vision, the vision of dramatic poetry. The thought and expression here seem one and indivisible, which may prove even more than Liddell set out to prove: that in the two forms into which he altered the passage he must have taken away more than expression, so that his bald statement of the fact was not really a statement of the fact at all, the real full fact existing only in the thought and form of Shakespeare's verses.

The Dividing Line

There is one great dividing line in poetry best defined as by Theodore Watts-Dunton in his

famous article on Poetry in the *Encyclopaedia Britannica* (9th edition). He there says :

Of poetic imagination there are two distinct kinds: (1) the kind of poetic imagination seen at its height in Aeschylus, Sophocles, Shakespeare, and Homer, and (2) the kind of poetic imagination seen at its highest in Pindar, Dante, and Milton, or else in Sappho, Heine, and Shelley. The former, being in its highest dramatic exercise unconditioned by the personal or lyrical influence of the poet, might perhaps be called absolute dramatic vision; the latter, being more or less conditioned by the personal or lyrical impulse of the poet, might be called relative dramatic vision!

This is well worth bearing in mind as it will greatly help towards an appreciation of poetical values.

LESSON 4

The Structure of English Poetry

To enjoy to the full the reading of poetry, one must be able to appreciate the technical skill underlying the poet's inspired expression; this in turn requires some knowledge of the mechanical structure of verse forms.

Hazlitt, in one of his essays, writes :

Poetry is the language of the imagination and the passions. It relates to whatever gives immediate pleasure or pain to the human mind. It comes home to the bosoms and business of men; for nothing but what comes home to them in the most general and intelligible shape can be a subject for poetry. Poetry is the universal language which the heart holds with nature and itself . . . Wherever there is a sense of beauty, or power, or harmony, as in the motion of a wave of the sea, in the growth of a flower, there is poetry in its birth . . . It is not a branch of authorship: "it is the stuff of which our life is made." The rest is mere oblivion, a dead letter; for all that is worth remembering in life is the poetry of it . . .

A later critic, Robert Lynd, in an essay, "On Poetry and the Modern Man," says :

In poetry we are continually being re-born into new fairy lands . . . Poetry begins as a random voyage among the blue seas of fancy, though it may end with the return of a laden treasure-ship of the imagination into the harbours of home.

The Architecture of Poetry

When, therefore, the student has grasped the immense extent of the subject-matter of poetry, he should become acquainted with its architecture. An intelligent, well-read person, who has studied prosody (i.e. the grammar of verse), can write verse, but that great indefinable gift which we call inspiration is also necessary before the writer of verse can be promoted to the rank of poet. It is indeed this quality of inspiration which is never absent from great poetry.

How then is it possible to distinguish poetry from prose, seeing that the subject-matter of the former is so all-embracing? A simple example may help. Imagine you have a gardening friend who meets you one day and says "Red carnations are coming out in my garden now." He makes a prosaic, though perhaps interesting, statement. But if he says

Red carnations in my garden now are out

the fact is the same, put in a different form. The essential difference is the introduction of what is known as rhythm.

Various Verse Forms

Human beings, even from earliest childhood, have an instinctive sense of this. Writers of verse should therefore know how to obtain certain rhythms, and also how to use, at times, another device, called rhyme. Rhythm, rhyme, and certain verse forms will be here described. The subject is a large one, and lack of space will not allow it to be dealt with exhaustively here. It should also be borne in mind that there is no reason why writers should not invent new poetic forms, just as musicians compose new and moving combinations of sound. There is, indeed, a close affinity between poets and painters and musicians. The painter uses his pigments to produce his effects; the musician has all the instruments of the orchestra at his service; but their fellow artist, the poet, has only words to use. With these he must appeal to both mind and ear. Thus he should be a master of his material, and, as Coleridge says, should learn to use "the best words in the best order."

A final warning is necessary before verse forms are defined and set forth. No English words exist to denote these various forms. The terms used for them are therefore borrowed from the vocabulary used in the analysis of classical Latin verse. It is different when applied to English verse. These terms do not bear quite their original meaning. In Latin, metre (measure) is controlled by the "quantity" of the vowel. Thus a vowel in Latin, is always long if it comes immediately before two consonants, not necessarily in the same word. English metre is in no way affected by the length of the vowel, but simply by the stressing, or not, of syllables.

Rhythm and Rhyme

Rhythm is produced by a well-balanced recurrence of pauses and stresses. Oratory and good prose have a rhythm of their own, different from that possessed by verse, and easily distinguished from it, for it does not exhibit

anything like the regularity found in poetry.

The **cur**/few **tolls**/the **knell**/of **part**/ing **day**

is an example of a well-marked poetic rhythm. It is produced by a stressed syllable following regularly an unstressed one. It is actually the rhythm which appears to be most suited to the genius of the English language, and because poet after poet has used it almost instinctively, more is said about it in the next column.

Rhyme, which should really be spelt rime, since it is derived from the Old French *rime*, is produced by a repetition of the same sound at the ends of two or more lines which must follow on at once, or be near enough for the resemblance to strike the ear. In English rhyme it is necessary that the consonants preceding the rhyming vowels be different. Rhymes consisting of one syllable, such as "main," and "brain," "hill" and "still," are called masculine. Double rhymes such as "ocean" and "motion," or "follow" and "swallow," are called feminine.

It will be noted that rhyme does not depend on spelling, but only on pronunciation. Indeed, words with similar spelling often do not rhyme at all, e.g. "love" and "move," "farm" and "warm"; these are called "eye" rhymes. Anyone who knows hymns will also know the difficulties that have confronted the writers of them in their search for words to rhyme with "God," "blood," and "love." The English language, unlike French, is very limited in the number of its rhymes. Sometimes more than two syllables are used in order to obtain a rhyme; this is often done for a humorous effect. Thus, Sir W. S. Gilbert, a master of light verse, uses such rhymes as "diurnally," "externally," "infernally"; "in fear of him," "in rear of him,"; and "frolicking," "rollicking."

Assonance and Alliteration

Assonance is a term applied to an incomplete rhyme, where the vowels are identical, but not the consonants which immediately follow; thus "sane" and "fate"; "feet" and "deep"; and "roaming" and "floating."

Alliteration is the use of two or more words in one line beginning with the same consonant or vowel. Thus:

Five miles meandering with a mazy motion.

Some misguided anonymous writer exercised his ingenuity in writing an entire piece of verse of which each line was completely alliterative, and the whole alphabet was used:

An Austrian army awfully arrayed,
Boldly by battery besieged Belgrade . . .

and so on. But alliteration was an essential part of all Old English metres, and of many in Middle English. It had a fresh blossoming as late as Langland, whose *Piers Plowman* begins thus:

In a somer season, when soft was the sunne,
I shope me in shroudes as I a shepe were.

Feet and Scansion

In verse a specific combination of stressed and unstressed syllables is called a *metric foot*. The four feet most commonly used in English verse are shown in the table.

Syllables	Name of Foot with its Adjective	Examples
Non-stress + stress	Iamb(us), iambic	ap/**pear**, at/**tack**
Stress + non-stress	Trochee, trochaic	**ho**/ly, **stu**/pid
Stress + two non-stresses	Dactyl, dactylic	**mess**/enger, **mus**/ical
Two non-stresses + stress	Anapaest, anapaestic	colon/**nade**, re/ap/**pear**

Other forms occasionally found are *spondee*, consisting of two equally stressed syllables (hunchback, clothes-prop), and *amphibrach*, a stressed syllable between two which are unstressed (revengeful, amazing). The latter is not an easy form of verse to write, but Shakespeare used it successfully in

Most **friend**ship/is **feign**ing,
Most **lov**ing/mere **fol**ly:
Then **heigh-ho**/the **hol**ly,
This **life** is/most **jol**ly.

According to the number of *stresses* in a line, the verse is said to be monometer (1), dimeter (2), trimeter (3), tetrameter (4), pentameter (5), hexameter (6), heptameter (7), or octometer (8). To make matters clear, the lines quoted here are scanned. *Scansion* is the division of poetic lines into feet, the stresses being marked. It will be noted that some stresses are heavier than others, and that variations occur; it is seldom that an unfailingly regular metre is found.

The poetic line which has been found to suit the English language best is the five-stress one, the *iambic pentameter*. When this does not rhyme, it is called blank verse. Such lines rhymed in pairs are called heroic couplets. The following lines from *King Henry V* are an example of the regular iambic pentameter:

By **Jove**,/I **am**/not **cov**/etous/for **gold**,
Nor **care**/I **who**/doth **feed**/upon/my **cost**,
It **yearns**/me **not**/that **men**/my **gar**/ments **wear**,
Such **out**/ward **things**/dwell **not**/in **my**/de**sires**.

The way Pope handled the heroic couplet—a metre he much liked—is shown below:

Know then, thy**self**, pre**sume**/not **God**/to **scan**:
The **pro**/per **stud**/y **of**/Man**kind**/is **Man**,/
Plac'd on/this **is**/thmus **of**/a **mid**/dle **state**,/
A **be**/ing **dark**/ly **wise**/and **rude**/ly **great**./

Shakespeare used blank verse (unrhymed iambic pentameters) in his plays; Milton showed

himself its master in *Paradise Lost* and *Paradise Regained*; Wordsworth chose it for *The Prelude* and *The Excursion*; while Tennyson, in *The Idylls of the King*, Thomas Hardy in *The Dynasts*, and later poets, down to T. S. Eliot and Roy Campbell, wrought, in their different ways, the music of a mighty line.

One of the pitfalls against which the poet must take precautions is monotony. This is particularly so with poems of any length where a metre strictly maintained might have a soporific effect on the reader. So various devices are employed to avoid the danger. The poet sometimes starts his line with a trochee instead of an iamb; he adds an extra unstressed syllable at the end of the line, or he omits one syllable at its beginning. He avoids having too many end-stopped lines- that is, making each line a complete sentence in which the sense coincides with the metre--by carrying his sentences on from one line to the next. Examples are to be found in the quotations given.

The Caesura

Variation in the position of the *caesura* is a potent device against monotony. The caesura is the pause which occurs when the line is read aloud, and its position is clearly dictated by the sense. The opening lines of Milton's *Paradise Lost* show this :

> Of man's first disobedience || and the fruit
> Of that forbidden tree, || whose mortal taste
> Brought death into the world || and all our woe
> With loss of Eden, || till one greater Man
> Restore us || and regain the blissful seat,
> Sing, Heavenly Muse, || that on the secret top . . .

Monometers and dimeters are uncommon, though both have been written by that master of dainty verse, Robert Herrick. But *trimeters* and *tetrameters* are not at all uncommon. They are frequently found in hymns. The well known :

> O **God**, / our **help** / in **ag**/es **past**, /
> Our **hope** / for **years** / to **come**, /
> Our **shel**/ter **from** / the **storm**/y **blast**, /
> And **our** / eter/nal **home**./

is written in alternate tetrameters and trimeters. The formula *a* for the first, *b* for the second, and so on, is the convention for briefly describing the rhyme of a verse. The scheme here is therefore *ab ab*; the second rhyme is an " eye " one, for, though spelt similarly, " come " and " home " are imperfect rhymes.

The octosyllabic couplet, a form of the tetrameter, in which each line rhymes with the next, came from the French, and has been a favourite form for long narrative poems from the Middle English period to John Masefield.

The pentameter has already been described and its outstanding importance underlined. The *hexameter*, *heptameter*, and *octometer* are long lines which are not very suitable for the music of English verse, but have nevertheless been used by skilled poets. A form of iambic hexameter, called the alexandrine, constitutes the final line of the so-called Spenserian stanza (*see* below and Lesson 9). It was ridiculed by Pope, thus :

> That **like** / a **wound**/ed **snake** / **drags its** / slow **length** / **along**/

Macaulay used the heptameter in his stirring poem, " The Armada " :

> **Attend** / all **ye** / who **list** / to **hear** / our **no**/ble **Eng**/land's **praise** /

and Tennyson attempted the longest line of all, the octometer, in " Locksley Hall " :

> **Comrades**, / **leave** me / **here** a / **little**, / **while** as / **yet** 'tis / **early** /**morn**.

This is a trochaic measure with a syllable lacking in the final foot.

Longfellow produced in " Hiawatha " unrhymed *trochaic tetrameters :*

> **Then** the / **little** / **Hia**/watha
> **Learned** of / **every** / **bird** the / **language** . . .

" Evangeline " is in unrhymed *hexameters*

> **This** is the / **forest** pri/**meval**, the / **murmuring** / **pines** and the / **hemlock** . . .

In Tennyson's " Charge of the Light Brigade " there are unrhymed *dactyllic dimeters* :

> **Cannon** to / **right** of them,
> **Cannon** to / **left** of them,
> **Cannon** in / **front** of them . .

Byron used *anapaestic tetrameters* in :

> The Assyr/ian came **down** / like a **wolf** / on the **fold**, /
> And his co/horts were **gleam**/ing in **pur**/ple and **gold** ; /
> And the **sheen** / of their **spears** / was like **stars** / on the **sea**, /
> When the **blue** / wave rolls **night**/ly on **deep** / Galilee. /

J. E. Flecker produced an outstanding piece of verbal music in " The War Song of the Saracens " :

> And the **spear** / was a **Des**/ert physic/ian who **cured** / not a **few** / of ambition,
> And **drave** / not a **few** / to perdi/tion, with **med**/icine **bitt**/er and **strong** :
> And the **shield** / was a **grief** / to the **fool** / and as **bright** / as a **des**/olate **pool**.
> And as **straight** / as the **rock** / of **Stamboul** / when their **cav**/alry **thun**/dered / **along**.
> For the **cow**/ard was **drowned** / with the **brave** / when our **bat**/tle sheered **up** / like a **wave**,
> And the **dead** / to the **des**/ert we **gave**, / and the **glo**/ry to **God** / in our **song**.

Flecker obtains a remarkable effect not only on account of his mastery of the anapaest, but because of his unusual arrangement of rhyme. He uses the *internal rhyme* (known as the *Leonine*, or bisecting rhyme), as well as the rhyme at the end of the line. Thus " physician " and " ambition " in the first line rhyme with " perdition " in the middle of the second line ; " fool " in the third line rhymes with " pool," which in turn rhymes with " Stamboul " in the fourth, and so on. In addition to this, the words at the end of the second, fourth, and sixth lines also rhyme. The result of this elaboration is a poem which moves with a grand swing.

Other metres than those described here are used from time to time, and the student is strongly advised to try to analyse the metre of the poem he reads. He will find it a valuable and interesting exercise. He must bear in mind that the whole basis of English prosody is stress, not quantity, and the English poet is not slavishly bound to use exactly the same number of syllables in every line of a piece of verse he has chosen to write in a given measure. An attempt was made in Elizabethan times to write verse on the classical model based on the quality and length of the vowel. It was a complete failure.

The present century has seen many experiments in the production of Free Verse, or *Vers Libre*. This is by its nature very indefinite and therefore difficult to define. It is verse writing in which there is no fixed regular system of rhyme or rhythm. Words and phrases are so chosen as to give an effect less continuous than that which is found in prose, yet these words and phrases may well contain in themselves the genuine music and fire of poetry and possibly be all the more emotionally charged by reason of their freedom from the conventional forms. Walt Whitman, the American poet, first used this kind of verse writing in his *Leaves of Grass*, published in 1855, so the experiment is at least a hundred years old. The so-called "modern" movement in painting and sculpture, and the experiments of many contemporary composers into the potentialities of assonance, can be cited as fair parallels to the cult of free verse.

Epics, Lyrics, Odes, etc.

The *Epic* takes a theme of high purpose and immense scope, and ranges over a great variety of episodes, embellished with all the devices of the poet's art. In a number of "books," or parts, it narrates the deeds of its heroic figures and describes the scenes and persons they encounter, preserving always the balance and unity of the composition. In Greek we have the *Iliad* and *Odyssey* (each consisting of 24 books); in Latin, the *Aeneid* (12 books); in English, Milton's *Paradise Lost* (12 books) and *Paradise Regained* (4 books).

Lyrics are poems of emotional content, so called because the earliest specimens were intended to be sung to the lyre.

The *Ode* is a species of lyric, with a noble theme lending itself to profundity of thought; it has a varied and irregular metre, usually rhymed, and a certain magnificence of style. Dryden's "A Song for St. Cecilia's Day," Gray's "Ode on a Distant Prospect of Eton College," Wordsworth's "Ode on Intimations of Immortality," Shelley's "Ode to the West Wind" and "To a Skylark," and the six Odes of Keats are famous examples.

Dramatic poetry is a term that explains itself; all poetic plays come under this heading.

Pastoral poetry places its setting in rural life; it usually consists of conversations between shepherds, relating to their loves and their flocks; Spenser's *Shepherd's Calendar* typifies this almost extinct form.

The *Elegy* is a lament in verse. Gray's "Elegy written in a Country Churchyard," Shelley's beautiful "Adonais" (written on the death of Keats), and Tennyson's long "In Memoriam" may be given as instances.

Ballads are short tales, often legendary, told in a light and rapid metre and suitable for recitation.

There are also several recognized forms of poetic stanza, each composed on certain fixed lines.

The *ballad stanza* is strictly composed of four lines alternately of four and three iambic feet:

O come ye here to fight, young lord,
  Or come ye here to play?
Or come ye here to drink good wine
  Upon the weddin'-day?

The *elegiac stanza* is an iambic pentameter quatrain, rhyming *abab*:

Full many a gem of purest ray serene
  The dark unfathom'd caves of ocean bear,
Full many a flower is born to blush unseen,
  And waste its sweetness on the desert air

The same metre with a rhyme scheme *aaba*, in which the first, second and fourth lines rhyme and the third does not, is known as the *Omar Khayyam stanza*, because it was used in Edward FitzGerald's beautiful paraphrase of the Persian poet's *Rubaiyat*:

For some we loved, the loveliest and the best *a*
That from his Vintage rolling Time hath prest, *a*
Have drunk their cup a Round or two before, *b*
And one by one crept silently to rest. *a*

The *Spenserian stanza* (see Lesson 9) was so named after its inventor, who used it for *The Faerie Queene*. It consists of eight iambic pentameter lines followed by an alexandrine. The rhyme scheme is *abab bcbcc*. This stanza has been used by Thomson in "The Castle of Indolence," Burns in "The Cottar's Saturday Night," Byron in "Childe Harold's Pilgrimage" and Shelley in "Adonais." A verse from "Adonaïs" will illustrate this form:

He has outsoared the shadow of our night, *a*
Envy and calumny and hate and pain, *b*
And that unrest which men miscall delight, *a*
Can touch him not and torture not again. *b*
From the contagion of the world's slow stain *b*
He is secure; and now can never mourn *c*
A heart grown cold, a head grown grey, in vain, *b*
Nor, when the spirit's self has ceased to burn, *c*
With sparkless ashes load an unlamented urn. *c*

Before Spenser's time the 7-line stanza was common. Chaucer uses it in his "Troilus and Creseyde" and other poems, for instance—

O soth is seid, that heléd for to be
As of a fevere or other gret siknesse,
Men mosté drink, as men may alday see,
Ful bittré drinke; and for to han gladnésse

Men drinken ofte peyne and gret distresse ;
I mene it here, as for this aventure,
That through a peyne hath founden all his cure.

The *Octave Stanza*, or Ottava Rima, consists of eight iambic pentameters The rhyme is *ab ab ab cc*. This form was borrowed from Italy. It was used by Byron in " Don Juan," " Beppo," and " The Vision of Judgment." Both Shelley and Keats used it very successfully. The example is taken from Byron's " Beppo " :

They lock them up, and veil, and guard them daily, *a*
They scarcely can behold their male relations, *b*
So that their moments do not pass so gaily *a*
As is supposed the case with northern nations, *b*
Confinement, too, must make them look quite palely; *a*
And as the Turks abhor long conversations, *b*
Their days are either passed in doing nothing, *c*
Or bathing, nursing, making love, and clothing *c*

The *In Memoriam stanza*, although not invented by Tennyson, was used in his poem of that title. It consists of four lines, each with four iambic feet, rhyming *ab ba*

And so the Word had breath, and wrought *a*
With human hands the creed of creeds *b*
In loveliness of perfect deeds, *b*
More strong than all poetic thought *a*

The Sonnet

The *Sonnet* is a complete poem of fourteen lines with special rules as to the number and place of the rhymes. Each line is an iambic pentameter. There are two main sonnet forms, each with some variations. They are the Italian (or Petrarchan) type, actually dating from 1220, and the English variety. Sonnets were written in Italy by Petrarch, Dante, and Tasso, by Camoens in Portugal, by Ronsard and du Bellay in France.

The first English sonnets may be found in *Tottel's Miscellany*, published in 1557; they were paraphrases from Plutarch, made by Sir Thomas Wyatt and the Earl of Surrey. Sir Philip Sidney's " Astrophel and Stella " (1591) gave the sonnet its vogue, and it has been computed by Sir Sidney Lee that more than two thousand were published between 1591 and 1597, including cycles by Constable, Daniel, Lodge, Drayton, Chapman, and Campion. Spenser used his own variant and so did Shakespeare ; both had many followers. Later came Drummond of Hawthornden, and Donne composed two sequences of religious sonnets. Milton wrote some noble sonnets, but after his time the sonnet form was neglected. Wordsworth revived it, and Keats, Mrs. Browning, D. G. Rossetti, and Christina Rossetti all composed beautiful examples.

Each sonnet is divided into an octave (the first eight lines) and a sestet (the last six). In the strict Italian form there is a marked break between the octave and sestet ; in the modified form, which Milton and other poets followed, there is no such break. The rhyme scheme in the orthodox form is : *abba, abba, cde, cde*. In the modified form the rhymes are the same in the octave, and the variations, which are many, occur in the sestet ; thus the scheme is *abba abba, cd cd cd*, or *cd cd ee*, and many other varieties. An excellent example of a beautiful sonnet, with rhyme variations in the sestet, is Christina Rossetti's " Remember " :

Remember me when I am gone away, *a*
Gone far away into the silent land; *b*
When you can no more hold me by the hand, *b*
Nor I half turn to go, yet turning stay. *a*
Remember me when no more day by day *a*
You tell me of our future that you plann'd; *b*
Only remember me ; you understand *b*
It will be late to counsel then or pray. *a*
Yet if you should forget me for a while *c*
And afterwards remember, do not grieve ; *d*
For if the darkness and corruption leave *d*
A vestige of the thoughts that once I had, *e*
Better by far you should forget and smile *c*
Than that you should remember and be sad. *e*

Shakespeare's form of sonnet really consists of three quatrains and a rhyming couplet, thus: *abab cdcd efef gg*. Spenser's sonnet has a more closely knit rhyme scheme, as follows : *abab bcbc cdcd ee*. There is no division into octave and sestet. A good example of one of Shakespeare's sonnets is

Shall I compare thee to a summer's day ? *a*
Thou art more lovely and more temperate *b*
Rough winds do shake the darling buds of May, *a*
And Summer's lease hath all too short a date *b*
Sometime too hot the eye of heaven shines, *c*
And often is his gold complexion dimm'd ; *d*
And every fair from fair sometime declines, *c*
By chance or nature's changing course untrimm'd *d*
But thy eternal Summer shall not fade *e*
Nor lose possession of that fair thou owest *f*
Nor shall Death brag thou wanderest in his shade, *e*
When in eternal lines to time thou growest *f*
  So long as men can breathe, or eyes can see, *g*
  So long lives this, and this gives life to thee. *g*

It will be noted that in the Italian forms the maximum number of rhymes is five, and may be only four. Shakespeare uses seven rhymes, and Spenser five. Rupert Brooke in his well-known group of sonnets, which are quite irregular in structure, uses seven rhymes.

No Special Poetic Language

Finally it must be remembered that poetry possesses no particular form of language peculiar to itself. In the 18th century poetry became linked up with a peculiar form of diction. Birds were " the feathered quire," men were " swains," heaven was " the azure vault," the moon became " the refulgent lamp of night," and so on. Even the so-called "poetic imagery" of metaphor and simile is not the essence of poetry, although, like rhyme or alliteration, it may help to make poetic thought more pointed, more memorable. Metaphor, simile, and other such devices are common to both poetry and prose.

The publication of the *Lyrical Ballads* in 1798, together with Wordsworth's outspoken and oft-repeated opinion that the language of everyday

life was the proper raw material for the poet, helped to give a mortal blow to artificiality of diction. The poet of to-day enjoys considerable latitude ; he need not simplify, any more than he need elaborate. He may use inversions, and in general his vocabulary and syntax are not limited to those which would be found in prose. There is infinite scope for variety.

English is a noble, flexible, and expressive language, and in using it poets of genius have produced poetry unsurpassed in any European literature.

LESSON 5

Old English Verse

It is hardly possible to overestimate the value and importance of English literature. It has the distinction of being the greatest literature in the world. This claim is due not only to the fact that it started earlier than any other European literature, but also because in the merit of its various forms, and in quantity, it excels all others, and from its early beginnings it has shown an astonishing vitality.

A great part of Early English literature was written in metre, and this will form the subject of the present Lesson, the prose being dealt with in a later group of Lessons. First, however, a word must be said about the language which these primitive writers used.

Old English Language

The earliest form of the English language from the beginning to about one hundred years after the Norman Conquest is sometimes called Anglo-Saxon, but more generally Old English. By its vocabulary and system of inflexions it is seen to be of West Germanic stock, but it also contains a considerable element of Latin loan words. In appearance it looks like a foreign tongue, and many are the changes and simplifications it has undergone in its passage through the years. Except to the specialist student, all the earliest works are a closed book save in translation.

In order that the student may have some idea of the difficulty of Old English, one of the best known pieces in our language, the Lord's Prayer, is given below in the Anglo-Saxon translation of A.D. 995.

Faðer ure ðu ðe eart on heofonum, si ðin nama gehalgod ; to-becume ðin rice ; gewurðe ðin willa on eorþan swa swa on heofonum ; urne doghwamlican hlaf syle us todog ; and forgyf us ure gyltas, swa swa we forgyfaþ urum gyltendum ; and ne gelod us on costnunge ac alys us of yfele. Soþlice.

(þ (thorn) and ð (eth) were runes which survived in the Old English alphabet ; they were interchangeable, and equivalent to " th.")

The oldest English poetry is to be found in the pagan " charms," which have been only partially Christianised. There are other pagan remnants, somewhat later in origin ; these are obviously the work of experienced writers. *Beowulf*, the greatest and longest of all early European poems—its length is 3,183 lines—exists in one manuscript in the British Museum. Three other ancient volumes, the Exeter Book, the Vercelli Book, and the Junian manuscript, contain nearly all the rest of Old English poetry.

Chief Characteristics

The chief characteristics of Old English poetry are :

(1) Long lines divided into half-lines by a well-marked pause in the middle.

(2) The two halves of the line are linked together by alliteration either of vowels or of consonants.

(3) In each half-line there are two accented syllables, which may be marked either by the alliteration or by the natural emphasis of the sense, and a varying number of unaccented syllables.

(4) The versification relies on alliteration and accent ; rhyme is practically unknown before the Norman Conquest.

The verses were made for oral delivery, and were probably chanted by a minstrel. As George Sampson says :

> P[illegible] pp[illegible] Anglo-Saxon verse is the " pointing " of the Psalms in the Church service, i.e. the fitting of verses with no fixed number of syllables to form a chant with a fixed number of accents.

Of the smaller poems which have survived, the first is " Widsith," or " the man who has travelled widely." In a difficult poem of 143 lines, the bard speaks of his wanderings and the kings of whom he has heard, how at the court of Formanric he sang the praises of the lady Ealdhild, and how he and his mate Scilling were held in honour wherever they went. " Widsith " may date from the 5th century, with later interpolations.

" Deor's Complaint " is a poem of 42 verses. It is possibly contemporary with *Beowulf*. It is the story of Deor, a minstrel, who has been supplanted by his rival, Heorrenda. He consoles himself by thinking about the troubles of others, and each verse ends with the refrain :

> þōs ofereode : þisses swa mōg.
> (That was lived through : so this can be.)

"The Wanderer" is an elegy of 115 lines telling of the wandering of a man who has lost his protecting lord and travels upon the waters to find a resting-place. In this moving poem the poet dreams of his former happiness, and reflects on the trials and changes of this life. The last verse has been translated thus :

All is full of trouble, all this realm of Earth !
Doom of Wyrds* is changing all the world below the skies ;
Here our fee is fleeting, here the friend is fleeting,
Fleeting here is man, fleeting is the kinsman !
All the Earth's foundation is become an idle thing.

* Wyrd (weird) means Fate or Destiny.

"The Seafarer" is 100 lines in length. It may be a monologue, but is considered by some scholars to be a dialogue between an old seaman who knows both the hardships and the attractions of a sailor's life, and a young man who will not be deterred, whatever the consequences, from a life of adventure on the sea.

"The Ruined Burg," a short poem of 35 lines, describes the devastation by the Saxons of a Roman town, probably Bath. It shows, with real feeling, the contrast between the prosperity of the past and the desolation of the present.

"The Wife's Complaint" and "The Husband's Message" are two fragments obscure at times because of the imperfection of the manuscript in the Exeter Book. In the former the wife complains of her banishment from her lord through false tongues. "The Husband's Message" is a call to a woman from her husband who has been compelled to leave his home through a blood feud. He has prospered in a foreign land, and asks his wife to sail and join him.

From this early period there are also two fragments, "Waldhere," in which a warrior flees with his love from the Huns, and "The Battle of Finnsburg," from an old saga.

One feature which these poems all have in common is parallelism ; the thought expressed in the first half of a line is repeated in paraphrase in the second half. Another feature is their paganism, though Christian sentiments have sometimes been added.

"Beowulf"

Beowulf is by far the most important of all the Old English poems, not only on account of its length, but because it is the earliest and best of the northern hero-poems. The story tells how Beowulf, hearing that the man-monster Grendel haunts Hrothgar's hall and devours his thanes, sets sail to deliver him. He wrestles with the creature and tears out his arm, and Grendel escapes only to die through loss of blood. Next day, Grendel's mother ... vengeance, and Beowulf has to seek her ... slay her with his magic sword. He ... Hrothgar in triumph and is laden with gifts. Years later, as an old man, he has his last fight with a dragon which guards a hoard of treasure. He slays the dragon, but is himself wounded to death, and the poem ends with an account of his funeral pyre.

The customs of the times are revealed, the attitude towards women, and the hard and joyless lives which our forefathers endured. There is much that is of interest concerning the communal life of the warriors, as spent in the hall of their lord. The long northern nights brought fear and uncertainty. Against men and beasts men could fight bravely, but against the workings of Wyrd they felt helpless.

The existing manuscript of the poem is in the West Saxon dialect, and belongs to some period between the tenth and twelfth centuries. Where *Beowulf* is not legend, it deals with historical events which occurred about A.D. 520. In substance it is heathen, but it contains several passages distinctly Christian in sentiment. It shows signs of having had more than one revision.

The remaining poems with which the student is concerned are Christian in character. Inexorable Wyrd gives place to an all-loving Father, and the darkness of the terror-haunted yields to light and hope. Christ and the saints now inspire the poets' work.

Caedmon and Cynewulf

The first English poet whom we know by name is **Caedmon** (*fl.* 670). The great Bede (673–735) in his *Ecclesiastical History of England* (written in Latin), tells this beautiful story of him.

Caedmon used to tend the cattle in the monastery at Whitby. One night he fell asleep in the stable and there came to him the vision of One who said: "Caedmon, sing me something." He answered, "I cannot sing, and for this cause left I the feast." "Yet," said the divine visitant, "you must sing to me." "What shall I sing?" asked Caedmon. "Sing," the other replied, "the beginning of created things."

At once Caedmon began a hymn in praise of the Creator, and when he awoke he remembered it. He became a monk, and continued in the Abbey till joyfully he died at peace. He sang each day the Scripture history and about the Judgement Day.

It is probable that very little can now with any degree of certainty be attributed to Caedmon, though there are poetic versions of Genesis, Exodus, and Daniel, together with a poem called "Christ and Satan," which, if not by the master himself, were certainly written by members of his school. The Hymn quoted by Bede in his *Ecclesiastical History* is his only authentic composition.

The one other poet of outstanding importance is **Cynewulf**, a Northumbrian, who flourished in the latter part of the 8th century. To him are attributed poems on New Testament subjects and legends of the martyrs. Of these the finest

is his "Crist," which in three splendidly conceived episodes presents the Nativity, the Ascension and the Day of Judgement.

Deep creation thunders, and before the Lord shall go
Hugest of upheaving fires o'er the far-spread earth!
Hurtles the hot flame, and the heavens burst asunder,
All the firm-set flashing planets fall out of their places.
Then the sun that erst o'er the elder world
With such brightness shone for the sons of men
Black-dark now becomes, changed to bloody hue
And the moon alike, that to men of old
Nightly gave her light, nither tumbles down;
And the stars also shower down from Heaven,
Headlong through the roaring rift, lashed by all the
winds.

Remarkable, too, is Cynewulf's "Elene," which describes the discovery of the true cross by the empress Helena, mother of Constantine. His other poems were "The Fates of the Apostles" and the fragmentary "Descent into Hell." He wrote part, at least, of "Guthlac," which relates the life and death of the Mercian saint. There is reason to suppose that he was also author of the beautiful "Dream of the Rood" and of "Andreas." The dull "Juliana" is his early work; with this exception, all his poems are characterised by their imaginative force. Of the 95 "Riddles" extant, many are attributed to Cynewulf.

Old English verse, after its first flowering, showed a complete collapse which it is difficult to explain. Apart from the poem on the Battle of Brunanburh (937), found in the Anglo-Saxon Chronicle, there are only two poems of any importance. The first is "Judith," a lively fragment of 350 lines giving part of the Apocryphal story. The second is "The Battle of Maldon," a vigorous poem of which the end is lost. It describes the fight between the English, under ealdorman Byrhtnoth, and the raiding Northmen under Anlaf, in 991. With these fragments Old English poetry ends.

LESSON 6

Middle English Metrical Romances

Of all European literatures, English was clearly the most important up to the end of the 10th century. Then for the next two hundred years it suffered an almost complete eclipse. From the time of the Norman Conquest until about the end of the 13th century, French literature was predominant in nearly every branch. In the 14th century, owing mainly to its three giants—Dante (1265-1321), one of the greatest poets the world has ever known, Petrarch (1304-1374), and Boccaccio (*c.* 1313-1375)—Italian literature obtained the leadership until in the last quarter of the century Chaucer regained the supremacy for England.

It is not difficult to understand the decline of English letters in the 11th and 12th centuries. In 1066 there took place the conquest of England by the Normans (= North men), who, although sprung from a stock similar to the English, brought with them a new language and new ideas which were to form a close link with Continental culture. Moreover, there was to be a struggle between Norman-French and English for mastery. English, deep-rooted in the soil and of sturdy growth, was to survive with a much increased vocabulary. Thus before 1150 there emerged a form of our language, known for convenience by the name of Middle English, which embodied a large number of new words from Norman and Continental French. With it came a new form of literature which exhibited an amalgamation of English and Continental features. In metrical composition the French definitely won a victory, for rhyme was introduced and widely used. In dealing with the poetry of this period it is important to recall that writings could be circulated only in manuscript. Many of them, moreover, were still intended for chanting by minstrels.

The influence of imported subject matter was henceforth strongly marked. Romance became the great subject for the poet, and this was divided into three "matters": (1) "The matter of France" dealt with stories about Charlemagne and the Twelve Peers, with such outstanding heroes as Roland, Oliver, Ferumbras, Ogier the Dane, Huon of Bordeaux, and the Four Sons of Aymon. (2) "The matter of Britain" was the Arthurian legend. (3) "The matter of Rome the Great" embraced the whole of classical antiquity, including stories of Troy and Thebes, and several about Alexander, who by poets' magic was transformed into a feudal monarch. There are other stories which do not fall within these classifications.

The stories dealing with Charlemagne (742-814) and his knights are filled with adventure. They not infrequently describe gallant fights on the battlefield between Christian knight and Saracen warrior. A good example is "Sir Otuel," whose hero, a Saracen who insults Charlemagne and is challenged by Roland, is finally converted to Christianity.

The Arthurian Legend

The importance of the Arthurian legend is so great that a very brief explanation of its origins and influence must be given. The romantic figure of King Arthur has possibly some historical basis, and there is reason to believe that he was a chieftain or general in the 5th or 6th century. Mention is found in annals of the

battle of Mount Badon in 518, "in which Arthur carried the cross of Lord Jesus Christ on his shoulders." It is also stated that he fell at the battle of Camlan in 539.

King Arthur first appears as a hero of romance in Geoffrey of Monmouth's famous *History of the Kings of Britain.* This Latin work is not very reliable as history; the author sometimes allowed too much rein to his vivid imagination. He owns his indebtedness to a very ancient work in the British tongue, brought from Brittany.

According to Geoffrey, Arthur is the son of Uther Pendragon and Igraine, wife of Gorlois of Cornwall, whom Uther wins by means of Merlin's magic. He becomes King of Britain at the age of fifteen, and fights against Picts, Scots and Saxons. With "Caliburn" (Excalibur), his sword, he conquers Scotland, Iceland, Ireland and the Orkneys. He marries Guinevere, a noble Roman lady, and conquers many lands on the mainland of Europe. His court is at Caerleon on Usk. When summoned to pay tribute to the Emperor Lucius of Rome, he refuses and declares war. Guinevere and his kingdom are left in charge of his nephew, Modred. Arthur slays the giant of St. Michael's Mount when he is on his way to Rome. As Arthur's envoy, Sir Gawaine defies the Emperor, and bears himself well in the combat which follows. Arthur is about to enter Rome when he is warned that Modred has seized Guinevere and the kingdom. He returns with Gawaine, who is killed when he attempts to land. Modred and his recreant knights retreat into Cornwall, and in the final battle on the river Camel he is slain with all of them. Arthur, mortally wounded, is taken to the isle of Avalon for the healing of his wounds. Guinevere becomes a nun.

This is the Arthurian story in the barest outline. It has been expanded and modified in many details by subsequent writers. The Norman poet Wace mentions the Round Table as a means of settling precedence among Arthur's knights. The wounded king is expected to return from Avalon and resume his reign. Wace's work was used by Layamon in his poetic chronicle *Brut*, which introduces a supernatural element into the story; elves are present at Arthur's birth, and his sword and spear are of magical origin.

The Legend Developed

The story was developed by French writers, and Arthur became the centre of many legends. He is the chief figure only in the tales of his earlier years and of his death. His court, however, is the gathering-place for adventurous knights, when the king himself is but a figurehead. It is worthy of note that the gallant Gawaine is concerned in more deeds than any other knight. Some of Arthur's adventures are used by Malory, in his *Morte d'Arthur*, which Tennyson borrowed as the basis of his *Idylls of the King.* But the exploits of Arthur and his knights of the Round Table, the quest of the Holy Grail, the loves of Lancelot and Guinevere, and of Tristram and Iseult, have inspired many writers in different lands.

Thus in Middle English there is to be found a very considerable body of literature, which cannot here be examined in detail. It will only be possible to deal with some of the more important metrical romances. It must be borne in mind also that a new kind of love poetry was being introduced through France, by the influence of the wandering minstrels, the troubadours. Moreover, the attitude of men to life, and especially towards women, was becoming profoundly influenced by the chivalry of the Middle Ages.

The "Brut" and Others

Probably one of the most important poems of this period is the *Brut* of Layamon. It is written in a blend of the old alliterative verse with some rhyming octosyllabic forms according to the French pattern, and shows metre in its transitional form. It traces the "history" of England from the arrival of a legendary Brutus to Cadwalader (A.D. 689) and includes the first versions in English of the stories of Lear and Cymbeline.

"The Owl and the Nightingale," a poem of about 1,800 lines in the Dorset dialect, is of importance. It is written as a political debate, with legal formality, between the nightingale, who represents the world, and the grave owl, who represents the cloister. The poet shows considerable skill in the way he handles his octosyllabic couplets, and the result is a delightful poem. "Havelok the Dane," another poem of importance, tells how a Danish prince and an English princess come into their own again after being defrauded by wicked guardians. "King Horn" is another good story of lovers thwarted but eventually reunited. A little later came the racy romance of "Richard Cœur de Lion," in 7,000 lines. The popular "Guy of Warwick" is tedious and relates in long-winded fashion how Sir Guy saved England from Colbrand the Dane. "Sir Bevis of Hamtoun," a poem of about 4,000 lines, is of special interest; it contains nearly all the exciting ingredients which made a poem popular with our forefathers. The fighting against a dragon, which had now become a usual feature of medieval romance, is described with great effect.

"Sir Tristrem" tells the love story of the knight and Iseult; "Sir Launfal" deals with the love of a fairy for a mortal; "Sir Orfeo" is the tale of Orpheus and Eurydice related as a Celtic fairy story; "Ywaine and Gawain" describes the fight between the two knights until recognition brings the combat to an end; in "The Wedding of Sir Gawain," the knight saves the life of Arthur by marrying a loathsome hag who turns into a lovely maiden. "Amis and Amiloun" is one of the most moving of these stories. "The Romance of William of Palerne" (Palermo), a free translation from the French,

is an exciting narrative marked by real characterisation.

All these are examples of subject-matter chosen from a considerable number of metrical romances. They have certain features in common. They are nearly all anonymous; they have their being in a world of the imagination far divorced from everyday life, and they not infrequently strike the note of a Christendom constantly at war with the powers of darkness.

The most important group of these romances consists of four poems: "Pearl," "Patience," "Cleanness," and "Sir Gawayne and the Grene Knight." It is within the bounds of possibility that they are all the work of the same author. The poet combines variations of the old alliterative measure with rhyme. "Pearl" is probably an allegory on a dead child. The precious pearl has been lost in the ground, and the "joyless jeweller," in his sorrow, searches for it. He sees the maiden in dazzling white raiment covered with pearls, and she shows him a vision of the celestial city. But he wakes and finds himself on the hillside alone. "Patience" tells the Biblical story of Jonah, and contains a spirited description of a storm at sea. "Cleanness," or "Purity," is a rather long poem which illustrates, by means of stories from Scripture, the vices opposed to cleanness.

But the greatest of these poems is without doubt "Sir Gawayne and the Grene Knight." Written in a rather difficult Lancashire dialect, it consists of 2,530 lines in alliterative and rhyming verse, broken from time to time by a short refrain. The poem deals with one of King Arthur's knights and is a graceful comedy of temptation. It combines vitality with mystery, and excels in descriptions of the delights of hall-feast and hunt, and of a lonely ride taken by Sir Gawayne through the silence of the forest and the deep snow.

The Crusades (1096–1270), with their many contacts, were important in breaking down barriers between West and East. The European knights learnt, for the first time, how to enjoy hot baths and to take elementary precautions to prevent their bodies from being constantly verminous, and they brought back a number of Eastern tales.

One of the best of these is "Flores and Blancheflour," which relates the romance of a Christian princess, carried off by the Saracens, and brought up with a Christian prince, Flores. Other interesting tales from the East are "The Seven Sages of Rome," a poem of some length in which the main story is set in a framework of fourteen short tales; and "Ypotis," about Epictetus the Stoic, who flourished in the 1st century A.D., and held that virtue is mainly endurance and abstinence.

The tale of "Barlaam and Josaphat" is a real literary curiosity. It is a Christianised version of the legend of Buddha and was widely circulated as a Christian work until its Buddhist origin was discovered much later. It has a further interest because it contains a casket story which, with certain modifications, was used by Shakespeare in *The Merchant of Venice*.

The eleven short poems of **Laurence Minot,** written during 1333–52, are of interest mainly because they are the only verses of the period which are not anonymous. They celebrate in fervidly patriotic strain England's successes in battle under Edward III.

The lyric was just beginning to appear. From an unknown poet came the charming

> Sumer is icumen in
> Lhude sing cuccu . . .

The original manuscript of this poem, set to music, is in the British Museum. It has the added interest of being the first known English musical manuscript.

Devotional Verse

A certain number of devotional works in verse must be mentioned. The "Poema Morale," or "Moral Ode," consists of a series of reflections on the shortness of human life, the failure of wisdom to coincide with increase in years, the coming of judgement, and the joys of heaven. Metrically it is particularly notable, being written in rhyming couplets of fourteeen syllables. The "Cursor Mundi," a long poem of some 24,000 lines, written mainly in eight-syllabled couplets, has many episodes falling within seven "ages" which cover Biblical history and include the mythical finding of the Cross; the last section deals with Judgement Day. The poem was evidently very popular, since many manuscripts of it still exist. Well worth study, too, is the dramatic "Harrowing of Hell," which renders in lively verse the legend of Christ's visit to Hell to redeem the worthy who had died before His coming to earth.

The "Ormulum," another long poem of which there now survive 20,000 lines, written alternately in eight and seven syllables, is concerned with the Gospel for each day, with expositions thereon. It is the work of a monk named Orm or Ormin, who introduced a form of phonetic spelling, and by doubling the consonant after each short vowel has preserved for us a valuable record of the pronunciation of his day. In 1303 Robert Mannyng, a canon of the order of St. Gilbert of Sempringham, translated into eight-syllabled verse, under the title of "Handlyng Synne," the *Manuel des Pechiez* of William of Waddington, but he added freely to the original and, by means of anecdote and satire, made it far from dull reading.

There is also a fine "Story of Genesis and Exodus," and a notable Northumbrian version of the Psalter.

LESSON 7

Chaucer and the Rise of English Poetry

If one were to begin the study of poetry with the works of **Geoffrey Chaucer** (*c.* 1340-1400), it is doubtful whether one's progress would be immediate and sustained. For the study of Chaucer requires of the student some degree of cultured love for poetry, which is not so necessary to the immediate enjoyment of Shakespeare or Tennyson, since both of these great geniuses are comprehensible to the modern reader, being written in language not too far removed from our daily speech.

Geoffrey Chaucer

It is otherwise with Chaucer and the writers of the later medieval period. While the body of the language in which Chaucer wrote is the essential English with which we are all familiar, it is different in so many little ways that the reader never quite accepts it as his own tongue, but always finds in it a quaint and somewhat foreign flavour. For this very reason there is the more need that the serious student of literature should familiarise himself with it. Only so will he discover the charm of Chaucer.

The Language Enriched

It has been already noted (Lesson 6) that in Chaucer's day the rude and vigorous Anglo-Saxon speech of the common people had absorbed from the Norman-French of the aristocracy numerous words and idioms not yet assimilated, which later on were vastly to enhance the beauty and expressiveness of the language. Old French words, later modified in spelling and pronunciation, still continued to bear a resemblance to their originals ; thus "chamber" is *chaumbre*, "error" is *errour*, "authority" is *auctoritee*

Many verbs retain the old Germanic suffix "-en" for the infinitive, while the past participle has the "y-" or "i-" prefix, which had taken the place of the old "ge-."

Chaucer was no affected writer, but true to the speech of his day. As J. R. Lowell says pithily :

> He found our language lumpish, stiff, unwilling, too apt to speak Saxonly in grouty monosyllables, but left it enriched with the longer measure of the Italian and Provençal poets. He reconciled, in the harmony of his verse, the English bluntness with the dignity and elegance of the less homely southern speech.

Here only a few of the principles which Chaucer recognized can be indicated; they are substantially the principles of French poetry.

Note that most words ending in "-e" have to be read as though this letter formed a separate syllable, except when the word immediately following begins with a vowel, or sometimes when it begins with an "h."

The final "-e" should be sounded when it occurs at the end of a line.

The medial "e" is also usually sounded, and thus certain words ending in "-ed" or "-es" take a syllable more than they require in our modern speech.

A little care will enable the general student to enjoy to the full some of the grandest poetry in the language Be assured that Chaucer, once taken up as a task, will be continued as a pleasure.

Chaucer enriched English poetry with two new measures--the 7-line stanza and the decasyllabic couplet. The 7-line stanza, a decasyllabic measure rhyming *ababbcc*, afterwards became known as "rime royal" when James I of Scotland used it for his lovely Chaucerian *Kingis Quhair* (King's Book). It came into general use for serious verse until it was displaced by Spenser's 9-line stanza one hundred years later. The following passage from the Prologue to the Prioress's Tale (*Canterbury Tales*) shows how fluent and adaptable the measure could be.

> Lady ! thy bountee, thy magnificence,
> Thy vertu, and thy great humilitee,
> There may no tonge expresse in no science ;
> For som-tyme, lady, er man praye to thee,
> Thou gooest biforn of thy benignitee,
> And getest us the light, through thy preyere,
> To gyden us unto thy sone so dere

The decasyllabic couplet, used in *The Canterbury Tales*, consists of iambic pentameters rhymed, with an easy overflow from one line to the next.

> And I seyde, his opinioun was good.
> What solde he studie and made himselven wood[1]
> Upon a book in cloistre alway to poure,
> Or swinken[2] with his hendes and laboure
> As Austin[3] bit[4] ? How shal the world be served ?
> Let Austin have his swink to him reserved.

[1]mad [2]toil
[3]St. Augustine [4]bid

Chaucer's Life

Chaucer was the son of a London vintner who was in the service of the king. The boy Geoffrey entered the household of the Duke of Clarence, brother to the king. He bore arms against the French, was pensioned by Edward III, and married Philippa, a lady of the court,

whose sister was the third wife of John of Gaunt, another royal duke. Chaucer became one of the king's esquires, and was sent abroad on several missions. Thus he made contact with the leading personalities of his day, and from this full and varied experience he gained the shrewdness and worldly wisdom which characterise his work. He held many lucrative posts, and in 1386 sat in parliament, but this same year a decline in his fortunes set in. He died in 1400, and was the first poet to be buried in Westminster Abbey.

Earlier Poems

Chaucer must have had little time for writing poetry until his retirement from office in 1386. The early poems, such as "The Dethe of Blaunche the Duchesse" (wife of John of Gaunt) and the much finer "Dethe of Pité," have tenderness and charm but no sustained power. His first great work was "Troilus and Creseyde," written about 1380 3; "The Parlement of Foules" is a charming allegory, celebrating the betrothal of the new king, Richard II, to Anne of Bohemia, then came "The Hous of Fame," written under the influence of Dante, though in lighter mood, and left unfinished, like the admirable "Legende of Good Women." *The Canterbury Tales* were begun in 1386 and left incomplete.

During his lifetime these poems were circulated in manuscript copies. They were first printed by Caxton, who issued an edition of *The Canterbury Tales* about 1477, the earliest complete edition of his works was that by Godfray in 1532.

Chaucer's intense humanity comes out so inevitably in everything he wrote, his sympathy with his fellows, his delight in nature's ways, his jovial humour, his reverence, his occasional ribaldry, and his sorrow for his follies all these qualities serve to make him a most lovable personality. Lowell refers to him as "a truly epic poet without knowing it," and indeed we find in his poems occasional evidence of "absolute dramatic inspiration," which, if it were continuous instead of occasional, would carry him into the highest rank of the world's great poets.

Continental Influences

Creative though he was, Chaucer's genius was awakened by the influence of Continental literature, with which, as a scholar and traveller, he made acquaintance early in life. The French and Italian poets and story-tellers were familiar to him in the original, and he drew largely upon them for his material. His heaviest debt is to **Boccaccio,** his great Italian contemporary, whom, as well as Petrarch, he is popularly supposed, on somewhat slender evidence, to have met during a diplomatic mission to Italy. It is also probable that Dante's *Divina Commedia* affected him to a considerable extent. His verse-form was derived from the *trouvères* of France, who, for more than two hundred years before him, had been composing those epic poems which the *jongleurs* recited in castle halls.

Yet with all his borrowings, and even when he seemed only to have translated, Chaucer so wonderfully transmuted by his genius the material wherewith he worked that it was re-created, as is the case with all great artists. Boccaccio himself, from whose *Decameron* Chaucer drew so much for his *Canterbury Tales*, and whose *Filostrato* he so closely followed in "Troilus and Creseyde," took his stories from the popular medieval fiction of his time, and gave them classical form. But the artist mind of Chaucer is well illustrated in *The Canterbury Tales*, where every personage tells a tale that is suited to the teller's character, taste, or condition of life. No such dramatic fitness is observed in the *Decameron.*

"The Canterbury Tales"

The work with which Chaucer's name is always immediately associated is *The Canterbury Tales*. The plan of the work is familiar. A company of twenty-nine pilgrims, journeying to the shrine of Thomas Becket at Canterbury, gather in Southwark at the Tabard Inn, where the poet meets them and proposes to make one of the company. The landlord of the Tabard also offers to join the party and to act as guide. It is he who suggests that in order to beguile the tedium of the journey, each pilgrim should undertake to tell two stories, one on the road to Canterbury, the other on the return journey, and that the teller of the story voted the best will, on the return to the Tabard, be entertained to supper at the common cost.

Chaucer did not complete the task of relating every one of the stories to be told by the pilgrims. Twenty-four tales - several of them unfinished — exist, with linking material, forming only a fragment of his design—but a glorious fragment, which for nearly two hundred years remained the unequalled gem of English literature.

Prologue and Tales

In the Prologue, which is the very acme of Chaucer's achievement, the characters of the different persons are so vividly drawn that they live again for us in the very atmosphere of the Middle Ages.

The tales themselves vary in merit. The Knight's Tale of Palamon and Arcite is usually regarded as the finest, with the Clerk's Tale of Patient Griselda and the Man of Law's Tale of Constance running it close, together with the robustly humorous Nun's Priest's Tale of the Fox and the Hen; the Prioress's Tale of Little St. Hugh is a moving piece of work, and in yet another vein is the grim Pardoner's Tale.

The poet apologises for including certain stories more racy than polite :

And therefore every gentil wight I preye,
For goddes love, deemeth nat that I seye
Of evel entente, but that I moot reherce
Hir tales alle, be they better or worse,
Or elles falsen som of my matere
And therefore, who so list it nat y-here,
Turne over the leef, and chese another tale

This seems true enough from the artistic point of view, and from that of historical truth it is equally cogent, for it has to be borne in mind that the poet reflected in his mirror the manners of a rude age despite the fact that it was the time "when knighthood was in flower." We see no reason, therefore, to suppose he wrote thus "with his tongue in his cheek," as some critics have suggested.

Though Chaucer is best remembered for his *Canterbury Tales*, his "Troilus and Creseyde," based on the *Filostrato* of Boccaccio, ranks at least equally high as a poetic masterpiece, and has the advantage of being a composite whole. It is indeed one of the loveliest works of poetry in the English language.

For the young reader, we recommend that a start should be made with those exquisite little poems comprising "The Legende of Good Women," in which the poet relates the tragic love-stories of Cleopatra, Thisbe, Dido, Ariadne, and other faithful women who suffered through the selfishness of the men they loved.

The reader who has borne Chaucer company through two or three of these poems will require no counsel to cultivate acquaintance with the writings of this merry, wise, and gentle poet, who was a scholar, a lover of books and ancient lore, but not the less a lusty Englishman rejoicing in the out-of-door world.

LESSON 8

English Poets from Chaucer to Spenser

So commanding is the figure of Geoffrey Chaucer in English medieval literature that more than two hundred years have to pass in review before another stands beside him on the same plane. Even at the end of that time Spenser acknowledged Chaucer as his master ; but they have really little in common. Meanwhile several lesser figures serve to carry the story forward.

John Gower, a friend of Chaucer, may be described as a man of great talent, ripe scholarship, and character, though lacking the divine fire of genius.

He wrote three large works, one in French, one in Latin, and one in English. The first is no longer in existence. The second gives an account of the rising under Wat Tyler, and thus has some value in the eyes of the historian. His English work is entitled *Confessio Amantis* (A Lover's Confession), and its interest is mainly for the philologist. Gower died in 1408 ; the effigy on his tomb in Southwark Cathedral shows him with his head pillowed on his three ponderous works.

Open-air vigour and downright satire are the two dominant characteristics of *The Vision of Piers Plowman*, generallv accepted as the work of **William Langland** (*c.* 1330 1400), a clerk, or minor priest, born at Cleobury Mortimer in Shropshire. The years 1362 to 1398 have been established as the date of its composition, and the dark and light colouring of life in the 14th century—the increasing corruption of the Church on the one hand and the general spread of popular intelligence on the other—are clearly reflected in it. The poem, which comprises some 7,300 alliterative lines on the Old English model, was written for the people, and won considerable popularity.

This long work makes difficult reading, but is of considerable importance for the light it throws upon the period. Next to Chaucer's *Canterbury Tales*, it is by far the most important work in Middle English *Piers Plowman* has been described as "a vision of Christ seen through the clouds of humanity." It is divided into nine dreams. In the allegory many personifications are introduced, the most important of which are Meed (worldly success), Falsehood, Repentance, Reason, Truth, Hope, Conscience. Piers Plowman, first introduced as the type of the poor and simple, becomes gradually transformed into the Christ. Later in the vision appear Do-well, Do-bet, Do-best. In this poem and its additions the writer says a good deal about the abuses of his time, and discusses their remedy.

It has been suggested by certain scholars that *The Vision of Piers Plowman* is not the work of one writer, but of several, and that William Langland is therefore an assumed name, not a personal one.

John Skelton (*c.* 1460–1529) cuts no mean figure in 15th-century literature, despite the adverse criticism to which he has always been subjected. "Beastly Skelton" is how Pope dismisses him, and Puttenham in his *Arte of English Poesie* - which, published in 1589, was one of the critical works that accompanied the

Elizabethan literary revival—says of him: "Being indeed but a rude rayling rimer, and all his doings ridiculous; he used short distances and short measures, pleasing only the popular eare." The best reply is made by the poet himself:

For though my ryme be ragged,
Tattered and jagged,
Rudely rayne beaten,
Rusty and moth eaten,
If ye take it well therwith
It hath in it some pyth

Skelton was the English Rabelais, with a good deal of the Frenchman's learning, his unrestrained delight in word-play, something of his satire, much of his coarseness and his joviality. He was also capable of tender humour, as we see in "Philyp Sparwe," a girl's lament for her tame sparrow, killed by a cat.

Among the lesser English poets of the 15th century little more than mention need be made of Thomas Hoccleve and John Lydgate, followers of Chaucer, and Stephen Hawes, whose long allegory, "The Pastime of Pleasure," is his best-known work. It contains a magnificent epitaph:

O mortall folk! you may beholde and se
Howe I lye here, sometime a myghty knyght,
The end of joye and all prosperitee
In deth at last, thorough his course and myght:
After the day there cometh the derke night:
For though the day be never so longe
At last the belles ringeth to evensonge.

Scottish writers have a not unimportant part in the story. During the 15th century, when the lamp of culture burned low in England, it was kept glowing in the sterner regions of the north.

The first notable Scottish poet, **John Barbour** (1316 95), presented in *The Bruce* a 13,500-line national epic in octosyllabic verse, full of movement and observation, and accepted by authorities as historically accurate. The original is perhaps a little more difficult to read than Chaucer, whom Barbour resembles in his love of nature. Most collections of Scottish poetry include passages, notably the one beginning:

A! fredome is a nobill thing!

The following lines occur in the description of the launching of Bruce's galleys, with his little army of three hundred men, from the island of Arran, to cross the Firth of Clyde to Turnberry:

This was in Ver[1], quhen wynter tyde.
With his blastis hidwyus[2] to byde
Was our drywyn[3], and birdys smale,
As turturis[4] and the nychtyngale,
Begouth rycht sairely to syng,
And for to mak in thair singyng
Swete notis, and sownys ser,
And melodys pleasand to her.

[1] Spring [2] Bitter blasts
[3] Overpast [4] Turtle-dove

Barbour was archdeacon of Aberdeen for about forty years, and made several journeys through England and France, chiefly, it has been thought, to collect material for his books. It is unfortunate that his *History of the Scottish Kings* is lost; it was, no doubt, a racy annal.

King James I of Scotland (1394 1437) wrote many poems during his long imprisonment in England—notably *The King's Quhair* (Book) and "A Ballad of Good Counsel"—which are models of good English, graceful in style, and at times approach Chaucer in music and imagination. The student should read, in this connexion, Washington Irving's "A Royal Poet" in *The Sketch Book*.

Of **Robert Henryson** little is known except that he was a schoolmaster at Dunfermline and is among those named in Dunbar's "Lament for the Makers," printed in 1508. Henryson's *Fables* were popular; his modest genius is well shown in the "Taill of the Uplandis Mous and the Burges Mous" (the Country Mouse and the Town Mouse).

William Dunbar (*c.* 1460–1520) was, like Skelton, a priest, but on the whole he shows a better-balanced character; and although he can rival his contemporary in coarseness when he cares, he displays public spirit in his satires, and grace and wit in his allegories, and is at times capable of real pathos. Most of his life was spent at the Scottish court, and his most famous poem, "The Thrissil and the Rois" (The Thistle and the Rose), was an allegory on the marriage of James IV of Scotland with Margaret, eldest daughter of Henry VII of England. It is supposed that he accompanied the ambassadors who went to England to arrange the marriage.

Gavin Douglas (*c.* 1472 1522), third son of an earl of Angus, was important politically as well as in literature. It was about 1500 when he produced his earliest and longest original work now extant, "The Palice of Honour," and in 1513 he rendered the *Aeneid* into Lowland Scots. Though this was not printed for nearly forty years, it was the first translation of a Latin classic published in Britain. Douglas became bishop of Dunkeld in 1515, and in 1520, on the fall of his nephew, the 6th earl of Angus, fled to England and died suddenly in London of the plague. He was buried in the church of the Savoy.

Sir Thomas Wyatt and his friend Henry Howard, Earl of Surrey, were the English originators of amatory verse.

Sir Thomas Wyatt (1503–42) wrote many graceful sonnets and lyrical poems characterised by a grave courtliness rather than the light touch of the true love-poet. It was he who

introduced the sonnet into England from Italy. The **Earl of Surrey** (1517–47) was the first English poet to write in blank verse. He used this metre for his translation of the second and fourth books of Virgil's *Aeneid.*

With Wyatt and with Surrey, whom the French critic H. A. Taine, in his *History of English Literature*, describes as an English Petrarch, the language had acquired greater literary possibilities than it had before possessed. "Those who have ideas now possess an instrument capable of expressing them," says Taine.

Indeed Wyatt's lyrics are a fitting prelude to the glorious music of the Elizabethan age. Most often quoted are his lines beginning:

Forget not yet the tried intent
Of such a truth as I have meant;
My great travail so gladly spent,
Forget not yet!

and the stanza:

And wilt though leave me thus,
That hath lov'd thee so long
In wealth and woe among?
And is thy heart so strong
As for to leave me thus?
Say nay! say nay!

Surrey lacked this lightness of touch, but his name will always be remembered with gratitude as the inventor of blank verse. Though his lines sometimes limp, they opened up a new epoch.

The following lines are given as an example:

Who can expresse the slaughter of that night,
Or tell the number of the corpses slain,
Or can in teares bewail them worthily?
The auncient famous citie fallen down,
That many yeares did hold such seignorie.

Yet it was not in the work of any of these named poets (Chaucer always excepted) that medieval poetry achieves its fine flowering, but in simple balladry. Some of these ballads, like "The Battle of Otterbourn," tell a vividly dramatic story of contemporary events; others build up a series of legends round a central figure such as Robin Hood; others again are pure romance, like "Young Beichan" or "Clerk Saunders." As an example of the lilting charm of these anonymous verse narratives take the opening lines of "Robin Hood and the Monk":

In somer, when the shawes be sheyne
And leaves be large and long,
Hit is full mery in feyre foreste
To here the foulys song:

To se the dere drawe to the dale,
And leve the hilles hee,
And shadow hem in the leves grene
Under the grenewood tre.

The Scottish ballads are particularly notable for their liveliness, genuine poetic qualities, and sense of the supernatural.

The ballad metre is a quatrain, made up of alternating octosyllabics and hexasyllabics.

LESSON 9

The Poetry of Sidney and Spenser

To turn one's attention to the poetry of the first Elizabethan age is like looking with unskilled eyes upon a starry heaven, so bewildering and so brilliant are the names that glitter in the literary firmament of that wonderful period, with Shakespeare as the "bright, particular star." With the awakening of the English nation to a new and grander perception of conscious patriotism, the dusky clouds of medievalism had been suddenly dispersed by the bright sun of a new day.

There was nothing miraculous in the outbursts of poetry which heralded and accompanied the Elizabethan age. If from the time of Chaucer the genius and imagination of the country had languished, scholarship at least had ripened; and the medieval age did not pass away without leaving a legacy to the age that followed.

Loftier Idealism

The English language had assumed in the poetry of Wyatt and Surrey a perfection of form which it had not hitherto possessed. It was now to be used by writers imbued with loftier idealism than that of the age of chivalry and old romance. But during the transition period one would naturally expect to find the older notions of life still actuating writers who chronologically are to be reckoned Elizabethans. This is true in some measure of Spenser and Sidney, both of whom were born some four years before the accession of Elizabeth I.

Sir Philip Sidney (1554–86) was one of the most admirable of men and capable of very high achievement as a poet and prose-writer. Despite the shortness of his life, he won for himself a high place in the regard of his contemporaries and has been held in affection ever since.

He was born at Penshurst, Kent, and in early youth was sent to court, under the auspices of his uncle, the famous Earl of Leicester. He attracted the queen's favour, but this did not last long. Sent to the Netherlands with the small contingent which was grudgingly allotted to assist the Dutch in their resistance to Spanish aggression, he was fatally wounded at the battle of Zutphen in 1586 and died with a characteristically noble gesture, directing that the water brought to him should be given to a wounded

soldier—"Thy need is greater than mine." He was indeed the *beau idéal* of the age—"a verray parfit gentil knight."

His progress as a poet is shown in the sonnet-sequence *Astrophel and Stella*. The early part is weak and artificial, until at length

"Fool!" said my Muse to me, "look in thy heart and write!"

Sir Philip Sidney

Edmund Spenser

He soon gains in emotional strength, and two of these sonnets reach the heights. One of them is here reprinted:

With how sad steps, O Moon, thou climb'st the skies!
How silently and with how wan a face!
What! may it be that even in heavenly place,
That busy archer his sharp arrows tries?
Sure, if that long-with-love-acquainted eyes
Can judge of love, thou feel'st a lover's case;
I read it in thy looks, thy languish'd grace,
To me, that feel the like, thy state descries.
Then, even of fellowship, O Moon, tell me,
Is constant love deem'd there but want of wit?
Are beauties there as proud as here they be?
Do they above love to be lov'd, and yet
Those lovers scorn whom that love doth possess?
Do they call virtue there ungratefulness?

Equally famous is the sonnet beginning "Come sleep, O sleep, the certain knot of peace," and among the lyrics scattered throughout the prose romance *Arcadia* is the charming sonnet "My true love hath my heart and I have his." Another memorable lyric is the song-like

Ring out your bells, let mourning shows be spread,
For Love is dead:
All Love is dead, infected
With plague of deep disdain;
Worth, as nought worth, rejected,
And Faith fair scorn doth gain.
From so ungrateful fancy,
From such a female frenzy,
From them that use men thus,
Good Lord, deliver us.

Sidney was one of the most modest of men, and it is to his sister, the Countess of Pembroke, that the world owes the preservation of most of his work. In so short a life he achieved more than most writers. His dignified *Defence of Poesy* showed him to be a penetrating and learned critic. The *Arcadia* will be discussed in a later Lesson.

Edmund Spenser (*c.* 1552–99) was a poetical star of far greater magnitude. He was born in London about 1552, the son of a working clothmaker who managed to give him his education at Merchant Taylors' School and Cambridge. He won the friendship of Sir Philip Sidney, and it was through Sidney's influence that he received an appointment in Ireland. For ten years he occupied Kilcolman Castle in County Cork. Here he was visited by Sir Walter Raleigh, who became his friend and to whom he read the manuscript of *The Faerie Queene*. Instantly recognizing the quality of this stupendous poem, Raleigh took the poet under his protection and presented him to Queen Elizabeth. In 1598 he was made sheriff of Cork. The same year saw Tyrone's rebellion in Ireland; Kilcolman Castle was sacked and burned, and it is believed that Spenser's young son, a baby, perished in the flames. The poet was sent to London with a dispatch to Queen Elizabeth. In 1599 he died in a Westminster tavern, "for lacke of bread," says Ben Jonson.

"The Faerie Queene"

Spenser's fame rests chiefly on his *Faerie Queene*, which, though only half finished, is a masterpiece dwarfing all his other work, lovely as that often was.

The Faerie Queene, Gloriana, is holding her annual feast, of twelve days' duration. On each day a complaint of injustice is brought to her, and one of her knights rides forth to redress the wrong. His adventures are described at length, each in a separate book running to many cantos. The poem is an allegory, each knight representing some noble quality which is brought into conflict with a personification of evil. Thus St. George, the Knight of the Red Cross, is Holiness, setting forth to slay the Dragon, which is Wickedness. Sir Guyon, hero of Book II, is Temperance; the lady Britomart, in knightly armour, is Chastity. Sometimes, too, there is a subsidiary allegory; Gloriana is Glory and she is also Queen Elizabeth.

Into this magnificent poem Spenser wove his thoughts and his dreams. It is his vision of life, harmonious, colourful, lit with "the light that never was on sea or land." Prolix it may be, and lacking in constructive skill, but those who have yielded to the spell of its incomparably gorgeous pageantry will read on with unflagging zest, caring not at all if there be no blueprints whereby one can examine the proportions of this faery structure.

The allegorical purpose of the poem is never obscured. Spenser's women are the embodiment of beauty and virtue; his Una, Britomart, Amoret, Florimel, Serera, Pastorella, and Belphoebe, are unforgettable portraits. In landscape effects, too, he excelled, and in the magical modulations of sense and sound-rhythms. He is indeed "the poet's poet."

Of the twelve books intended, Spenser wrote six, together with the splendid Canto of Mutability. He used the stanza since associated with his name eight iambic pentameters with the addition of an alexandrine, rhyming *a b a b b c b c c*:

A gentle knight was pricking on the plain,
 Yclad in mighty arms and silver shield,
Wherein old dints of deep wounds did remain,
 The cruel marks of many a bloody field ,
 Yet arms till that time did he never wield :
His angry steed did chide his foaming bit,
 As much disdaining to the curb to yield :
Full jolly knight he seem'd, and fair did sit,
As one for knightly jousts and fierce encounters fit.

Spenser was already famous before the publication of *The Faerie Queene*. His first work, *The Shepherd's Calendar*, is pastoral poetry, often with an undercurrent of allegory. Later poems include *Muiopotmos, or the Fate of the Butterfly*, a delicate fairy tale ; *The Ruins of Time*, an exquisite series of elegies ; *The Tears of the Muses*, an inferior poem ; a paraphrase of Virgil's *Gnat* , the satirical *Mother Hubbard's Tale*, which deals with the corruption of the court, and the struggle between the Reformed Church and the Papacy ; the elegy *Daphnaïda* ; " Colin Clout's Come Home Again," a tribute to Raleigh ; the glorious *Epithalamion* for his own wedding, which overshadows the *Prothalamion* ; the *Amoretti*, a sonnet-sequence in thanksgiving for the happiness of his married life ; and the *Four Hymns* in honour of Love, Beauty, Heavenly Love, and Heavenly Beauty.

There can be no manner of doubt as to the eminent place of Spenser among the English poets. He is a master of the romantic epic, his invention is inexhaustible, the rhythm of his verse the very perfection of poetic form, his imagination so rich and sensuous that Campbell aptly called him " the Rubens of English poetry."

In his own day Spenser was immensely popular and had many followers. Somewhat surprisingly, he was also much admired by Dryden, Cowley, and Pope. In the early days of the Romantic revival towards the end of the 18th century Thomson, Shenstone, and others brought him into fashion. His influence may be traced in Wordsworth, in Shelley and Keats, in Byron, and later in Tennyson, Browning, Morris, and other poets.

LESSON 10

Lyric Poets of the 16th and 17th Centuries

It was one of the glories of the age that nearly every man of note was the possessor of literary talent.

Sir Walter Raleigh (1552 1618), whose prose will be mentioned in its proper place, was only incidentally a poet, but he wrote verse which is graceful and free from the more pronounced affectations of the period. A well-known example is his " Pilgrimage " :

Give me my scallop shell of quiet,
My staff of faith to walk upon,
My scrip of joy, immortal diet,
My bottle of salvation ,
My gown of glory, hope's true gage,
And thus I'll take my pilgrimage.

Michael Drayton (1563-1631) was a Warwickshire man and a friend of Shakespeare, who entertained him and Ben Jonson at Stratford a few weeks before his death. Drayton was a lyric and descriptive poet of very unusual qualities. His chief work, *The Polyolbion*, is a topographical account of England, displaying wonderful learning and containing many glowing descriptions, but utterly mistaken in its medium, which should have been prose. His *Barons' Wars*, another long poem, abounds in passages of great spirit, and *Nymphidia* is a delightful fairy poem. Best known of all his work is the lively " Ballad of Agincourt," and the magnificent sonnet :

Since there's no help, come let us kiss and part
Nay, I have done , you get no more of me ,
And I am glad, yea, glad with all my heart
That thus so cleanly I myself can free.
Shake hands for ever, cancel all our vows,
And when we meet at any time again
Be it not seen in either of our brows
That we one jot of former love retain
Now at the last gasp of Love's latest breath
When, his pulse failing, Passion speechless lies
When Faith is kneeling by his bed of death
And Innocence is closing up his eyes,
Now, at the last, when all have given him over,
From Death to Life thou might'st him yet recover.

An accomplished minor poet and scholar was **William Drummond** (1585 1649), of Hawthornden, near Edinburgh, the friend of Drayton and Ben Jonson. Besides miscellaneous verse, he wrote some fine sonnets.

Samuel Daniel (1562 1619) was dismissed by Ben Jonson as " a good, honest man, but no poet." His chief work was a lengthy *History of the Civil Wars between York and Lancaster*, but he also wrote some beautiful sonnets, which were greatly admired by Drummond.

John Donne (1573–1631) was the greatest preacher of his day and the leading exponent of the " metaphysical " school of poetry. His poems were first collected in 1633. With him passed the scholasticism of the Middle Ages. His religious poems, apart from their meta-

Michael Drayton

John Donne

Robert Herrick

George Herbert

physical style, express rare qualities of purity and intensity and his "essential joy in this life and the next." "The Progresse of the Soule" is his most serious effort, but is unfinished. Besides the *Divine Poems*, Donne's highest achievements were his *Songs and Sonnets*. Here is the first stanza of "The Anniversary," an example from that volume.

All kings, and all their favourites,
All glory of honours, beauties, wits,
The sun itself, which makes time, as they pass,
Is elder by a year now than it was
When thou and I first one another saw,
All other things to their destruction draw,
Only our love hath no decay
This no tomorrow hath, nor yesterday :
Running, it never runs from us away,
But truly keeps his first, last, everlasting day.

Recent years have seen a considerable rise in the esteem in which Donne's work is held, and a revived and widespread appreciation of his poetic style, and also of his intellectual force. George Saintsbury summed up the poet's quality as proceeding from his "fiery imagination shining in dark places, the magical illumination of obscure and shadowy thoughts with the lightning of fancy."

The most prolific writer of the period was **George Wither** (1588 1667). Dryden wrote of him :

He fagotted his notions as they fell,
And if they rhym'd and rattled, all was well.

Although Wither's work is of unequal merit, he will always be remembered for his captivating lyric, "The Manly Heart." Here is the first stanza :

Shall I, wasting in despair,
Die because a woman's fair ?
Or make pale my cheeks with care
'Cause another's rosy are ?

Be she fairer than the day,
Or the flowery meads in May——
If she thinks not well of me,
What care I how fair she be ?

A delightful poet is **Thomas Campion** (*c.* 1575-1620). Born in London and educated at Cambridge, he was at one time a member of Gray's Inn and afterwards practised as a physician. He was held in high esteem as an authority on music by his contemporaries, and the words and music of his English airs are full of charm Representative of his talent is the song beginning :

If she forsake me I must die ,
Shall I tell her so ?
Alas, then straight she will reply
"No, no, no, no, no "
If I disclose my desperate state,
She will but make sport thereat,
And more unrelenting grow

Francis Quarles (1592-1644), who was a voluminous author, enjoyed an immense popularity in his own day and afterwards as a writer of religious poems. While he was one of Donne's school of metaphysical or allegorical poets, and something of a Puritan, he possessed a lively fancy and felicity of expression that do something to mitigate the effect of his strained conceits, and his *Divine Emblems* are still worthy of attention.

In **Robert Herrick** (1591 1674)—it is curious to note, by the way, that the lyric poets were longer-lived than most of the dramatists of this period—the first great age of English lyric poetry reaches its culmination and finds its crowning star. Described by Swinburne as "the greatest song-writer as surely as Shakespeare is the greatest dramatist ever born of English race," Herrick was a creative and inventive singer who surpassed all his rivals in quantity of good work. His *Hesperides* is a collection of lyrics unequalled in their quality of spontaneous instinct and melodious inspiration, and charged with a charm so incomparable that even English poetry can boast of nothing quite like it or worthy to be named after it.

Of the man himself and his life, very little is known. Born in London, the youngest child of a goldsmith who died the year after his son's birth, he became the ward of his uncle, Sir William Herrick, goldsmith and moneylender to James I. He was educated at Cambridge, and later became a disciple of Ben Jonson, and found

patrons and friends at Court. At what date he took holy orders is not known, but in 1629 the king presented him to the vicarage of Dean Prior, near Ashburton, in Devon. Ejected by the Puritans in 1647, he returned to London and gave his attention to the publication of his poems *Hesperides* and *Noble Numbers*. One of the most characteristic poems from *Hesperides* is quoted here:

To Daisies, Not to Shut so Soon.

Shut not so soon ; the dull-eyed night
Has not as yet begun
To make a seizure on the light,
Or to seal up the sun.

No marigolds yet closèd are ;
No shadows great appear ;
Nor doth the early shepherd's star
Shine like a spangle here.

Stay but until my Julia close
Her life-begetting eye ;
And let the whole world then dispose
Itself to live or die.

After the Restoration he was restored to Dean Prior, where, according to the parish register, he was buried.

That Herrick's conception of religion and views as to the rule that should govern a country parson's life were not identical with those of "holy George Herbert" is obvious enough from the robust vigour of all his verse and from the not infrequent coarseness and the even offensive blemishes that sometimes deform the loveliness of his genius. But the man was no hypocrite, and it is impossible to believe that the *Noble Numbers* are in the least insincere. It has been said that he was the last of those poets who entirely relished earthly life while wholeheartedly believing in another and a better. On the whole, it is a pleasant picture that emerges from his poems—a country clergyman on excellent terms of easy familiarity with his poor parishioners, enjoying a carefree bachelor existence, with a spaniel and, according to tradition, a tame pig for his constant companions, and one faithful old maidservant to keep house for him. And for his own intellectual occupation, this gift of song.

A happy man, this ; certainly not one to make any parade of piety in his daily bearing, but one nevertheless with very clear principles of private conduct. Of poets he says:

Wanton we are, and though our words be such,
Our lives do differ from our lines by much.

And the discerning reader will not fail to see the special significance of Herrick's choice of a similar distich for the final poem in the original edition of *Hesperides*:

To his book's end this last line he'd have placed :
Jocund his muse was but his life was chaste.

George Herbert (1593–1633) was yet another poet whose work was influenced to its disadvantage by his admiration for his friend John Donne. But marred though it is by the often irritating conceits that distinguish the school, his chief work, *The Temple*, is packed with thought and precept and has poetical merit of a very rare, lofty, and original order that makes it rank with the best religious verse in the language. The manuscript, now in the Bodleian, was given by Herbert on his deathbed to his friend Nicholas Ferrar, who effected its publication at Cambridge in the same year (1633). Of the "Sacred Poems and Private Ejaculations," planned in reference to church architecture, numbering over 160, of which *The Temple* is composed, the one that is perhaps the best known is this beautiful verse on Virtue:

Sweet Day, so cool, so calm, so bright,
The bridal of the earth and sky,
The dew shall weep thy fall tonight :
For thou must die.

Sweet Rose, whose hue angry and brave,
Bids the rash gazer wipe his eye,
Thy root is ever in its grave,
And thou must die.

Sweet Spring, full of sweet days and roses,
A box where sweets compacted lie,
My Music shows ye have your closes,
And all must die.

Only a sweet and virtuous soul,
Like season'd timber, never gives ;
But though the whole world turn to coal,
Then chiefly lives.

A remarkable poet and prose-writer whose work was discovered only at the beginning of the 20th century, was **Thomas Traherne** (1636?-1674). His poems, mystical in content, are couched not only in the pliant verse-forms of his contemporaries, but sometimes in a form of free verse similar to that of Walt Whitman.

In the space available it is impossible to do more than note the names of Phineas and Giles Fletcher, William Browne, Sir John Davies, and Thomas Carew, "that delectable versifier," among the many minor lyric poets born in the 16th century. The number of them is indeed surprising, and there is hardly one of them but was capable of writing distinguished verse.

It has been deemed convenient for the purpose of these Lessons not to follow the usual plan of dividing the Elizabethan age into two periods, but to review at once the poets who are epic, e.g. Spenser ; narrative, e.g. Drayton ; or lyric, e.g. Sidney ; and to reserve the dramatic writers for separate consideration. Naturally, some of the dramatists wrote lyrical verse: John Lyly, for example, whose exquisite "Cupid and Campaspe" is sheer perfection ; Robert Greene, admirably represented in this *genre* of poetry by his "Farewell to Folly" and "Sephestia's Song to Her Child" ; Ben Jonson, whose "Drink to me only with thine

eyes" (given in full on this page), one of the most engaging songs in our language, appeared in a collection of fifteen lyrics, entitled *The Forest*, in 1616; and many another, including, of course, Shakespeare himself; but in this Course they must be regarded and dealt with as essentially dramatic poets. The arrangement adopted, if somewhat arbitrary, serves at least to give some idea of the poets of the lesser order immediately preceding, contemporary with, and following Shakespeare and the Elizabethan dramatists.

TO CELIA

Drink to me only with thine eyes,
And I will pledge with mine;
Or leave a kiss but in the cup
And I'll not look for wine.
The thirst that from the soul doth rise
Doth ask a drink divine;
But might I of Jove's nectar sup,
I would not change for thine.

I sent thee late a rosy wreath,
Not so much honouring thee
As giving it a hope that there
It could not withered be;
But thou thereon didst only breathe
And sent'st it back to me,
Since when it grows, and smells, I swear,
Not of itself, but thee.

There were also various eminent poetic translators of the period, such as **Sir John Harington** (1561-1612), who translated the "Orlando Furioso" of Ariosto, the Italian poet; and made an admirable version of Torquato Tasso's "Jerusalem Delivered."

The ordinary reader may be content to study all the poets mentioned in this Lesson in volumes of specimens, since a fair conception of their respective merits and of their united influence upon English literature can be obtained by reading some of their longer poems and a selection of their minor pieces.

LESSON 11

The Early Dramatic Writers

The drama is not only one of the world's oldest and noblest arts, but one that had its origin in religious worship. The art which produced in Shakespeare the greatest genius of all time was in ancient Greece an evolution of pagan ceremonial. In its modern form it might be described as a graft on the priestly propaganda of the medieval miracle plays and mystery plays.

Study of the Greek drama, important though it is, does not fall within the scope of this Course. Only such incidental references to it are made as may be necessary in discussing English drama. There is also this point to note. It is surely axiomatically true that drama which cannot be acted is no drama at all. Nevertheless, as this is a Course in English Literature, it is as literature—the dramatic form on the printed page rather than in the theatre, that drama is here to be considered. At least it can be argued that the less tolerable a play is on the stage, the less worthy of study it is likely to be as literature—and the converse is equally true.

One Burst of Glory

English drama might almost be said to have begun and ended in one great burst of glory; for if all that has been written since the last of the Elizabethans, with few exceptions, were to be wiped away, English dramatic literature would not be greatly impoverished. One may hope that this statement will not be justified a hundred years hence, for after more than a century of relative sterility, there are undoubted contemporary signs of a genuine revival of true dramatic literature.

The evolution of the English drama is sometimes ascribed to the old mysteries invented by the medieval clergy for the purpose of teaching ignorant people some smattering of Biblical knowledge. These crude representations of sacred history gave place gradually to the morality play, wherein the teachers of the people endeavoured to visualise before their dim intelligence the Christian virtues. From this it was but a step to the stage representation of the common life, and that step had been taken before the reign of Elizabeth I, Heywood's *Interludes* forming a link between the morality play and the drama proper.

George Gascoigne (*c.* 1525-77) was one of the earliest dramatists, and a poet of no mean place among the Elizabethans. His spirited satire, *The Steel Glass*, was the longest and one of the most virile compositions in blank verse before Milton. But in his dramatic work it is evident that he was influenced not so much by the disappearing morality play as by the ancient classical drama; his *Jocasta* is an adaptation from Euripides, while his *The Supposed*, from which Shakespeare borrowed for his *Taming of the Shrew*, was translated from Ariosto's *I Suppositi*, and is the earliest prose comedy in English.

Classical Influence

Indeed, it is hardly correct to speak of any link between the morality play and the modern drama, for in all countries the rise of the drama was the outcome of a revival of learning which led the writers to look back across the ages and to find their models in the ancient classical

drama. The machinery of the stage, however, was ready to their hand as it existed for the purpose of the moralities. The first English comedy in rhyming verse, *Ralph Roister Doister* written by **Nicholas Udall** (1506 56), master of Eton, for a holiday performance of the Eton boys, was modelled on the comedies of Plautus and Terence, while Sackville and Norton's *Gorboduc*, the first English tragedy, produced in 1561, was modelled on the tragedies of Seneca and is in blank verse.

" Gammer Gurton's Needle "

As an example of "transition" farce, *Gammer Gurton's Needle* must be mentioned. The farce was at one time thought to be older than *Ralph Roister Doister*. It is the work of a certain **William Stevenson,** a Fellow of Christ's College, Cambridge, where it was played in 1566; it was printed in 1575. It is rougher in character, more vigorous in action, than *Roister Doister*—" a piece of low humour," says Sir Walter Scott, " the whole jest turning upon the loss and the recovery of the needle with which Gammer Gurton was to repair the breeches of her man Hodge; but in point of manners it is a great curiosity." It contains the first drinking song of any merit to be found in our language—which may be, as some think, the work of Skelton. A verse of this rollicking rhyme may be quoted:

> I cannot eat but little meat,
>   My stomach is not good;
> But sure I think that I can drink,
>   With him that wears a hood.
> Though I go bare, take ye no care,
>   I nothing am a-cold,
> I stuff my skin so full within
>   Of jolly good ale and old
> Back and side go bare, go bare,
>   Both foot and hand go cold,
> But belly, God send thee good ale enough,
>   Whether it be new or old

Growth of True Comedy

Comedy shaped itself into true dramatic form earlier than tragedy, and the art owed well-nigh as much to such writers as Greene and Peele as tragedy did to Marlowe. Most of the early dramatists were poet-scholars, men who had been educated at Oxford or Cambridge, and who added to their knowledge of classical models a racy intimacy with the life of the day. This enabled them, while observing the ancient ideas of drama construction, to appeal to the common people, with subjects of living interest. In fact, these men of rare wit and scholarship were only too familiar with the life of their times, and their biographies, so far as we can ascertain them, are for the most part melancholy records of lives untimely sacrificed to debauchery.

It is noteworthy that Shakespeare, the great king of them all, was almost the only one who had no university training, and in the then-accepted definition of scholar could rank with few of his contemporaries. He was, moreover, one of the group who showed a better balance of character, observing a standard of conduct which to-day would have made him of almost " suburban " manners.

No detailed chronicle of the early drama can be attempted here; the poets only, rather than their art, can be dealt with, and even so only a few of the more notable of the dramatists. Among these, some mention must be made of **John Lyly** (1553 1606), as his name is conspicuous in the early Elizabethan period for reasons other than his talent. He is not a dramatist of any great ability, his comedies in prose and verse being unworthy of attention to-day, except from the close student of the Elizabethan drama. As stated in a previous Lesson, he had a lyrical rather than a dramatic gift, some of the songs in his plays being wholly delightful.

George Peele (*c.* 1558-?98) made more valuable contributions to comedy, though his plays are stronger in poetic fancy and form than they are in dramatic construction. His comedies, such as *The Arraignment of Paris* and *The Old Wives' Tale*, are as pretty and engaging as his tragedies, such as *The Battle of Alcazar*, are bombastic and preposterous.

Robert Greene (*c.* 1558 92) was a poet of very similar gifts to his boon companion Peele. A follower of Lyly as a novelist, the best of his genius is to be seen in the beautiful lyrics which are introduced in his prose romances and his plays. Shakespeare went to Greene's novel *Pandosto* for the outline of *The Winter's Tale.* Perhaps the most noteworthy of his dramatic pieces is *Friar Bacon and Friar Bungay.* One characteristic of Greene's dramas deserves notice, and that is his capacity for drawing lovable women, who foreshadow Shakespeare's peerless heroines.

While both Peele and Greene have no great interest for the general reader, the student desiring to familiarise himself with this period of our drama must not neglect either of these writers.

Another of the " University Wits " was **Thomas Kyd** (1558-94), a scrivener's son, whose violent play in the Senecan manner, *The Spanish Tragedy*, was for over 200 years the most widely performed Elizabethan drama outside Shakespeare's works and set the style for Kyd's contemporaries.

He is also the supposed author of the lost play of *Hamlet* on which Shakespeare is said to have based his great tragedy.

LESSON 12

Marlowe: Herald of English Drama

THE real herald of the English drama, the first great name in its annals, was **Christopher Marlowe** (1564–93), than whom there is no more melancholy figure. Son of John Marlowe, a shoemaker of Canterbury, he was, according to the records, christened exactly two months earlier than Shakespeare. Had their deaths as nearly synchronised as their births, had Marlowe not fallen a victim to a vicious and irregular life at the early age of 29, he might, his splendid powers ripened and exercised with the restraint of maturer judgement, have stood no more than a step behind Shakespeare himself.

Scholar-Poet

As a native of Canterbury, Marlowe enjoyed the opportunity of acquiring his early education at the famous King's School there, whence he proceeded to Benet (now Corpus Christi) College, Cambridge, perhaps at the expense of some wealthy patron. He graduated as B.A. in 1583 and as M.A. in 1587, emploving part of the intervening time in London in literary and dramatic work; it is established that both parts of his remarkable drama *Tamburlaine the Great* had been publicly performed in London at least as early as 1587.

Disfigured though it is by much bombast and fustian--faults, be it noted, that had not a little to do with its immediate immense popularity--*Tamburlaine the Great* is alive with real drama, and its style is instinct with poetic feeling. In the evolution of English blank verse this play, moreover, makes a cardinal point. Unrhymed iambic pentameter verse had been used both for epic and for dramatic purposes before Marlowe's time; but, composed strictly on the classical model, with a pause at the end of each line, it had acquired a monotony which deprived it of all freedom of movement.

Not yet had Marlowe perfected his own use of the measure, for he indulged too freely in sonorousness and rotundity of declamation, but already his "mighty line" is an accomplished fact destined to have a permanent influence on the whole subsequent development of this verse form.

"Faustus"

Records of the production of Marlowe's works are somewhat confused, but it is probable that his *Tragical History of Dr. Faustus* was composed soon after *Tamburlaine*. *Faustus*, his greatest and best-known work, is founded on the legend of the German magician who, for twenty-four years of unrestrained life, sold himself to the devil both body and soul. It is also the theme of Goethe's greatest poem. "There is," says Hallam, "an awful melancholy about Marlowe's Mephistopheles, perhaps more impressive than the malignant mirth of that fiend in the renowned work of Goethe. But the fair form of Margaret is wanting; and Marlowe has hardly earned the credit of having breathed a few casual inspirations into a greater mind than his own." Goethe himself, however, was enthusiastic in his praise of Marlowe's version of the legend.

"The Jew of Malta"

Of *The Jew of Malta*, which was probably the third in chronological order of Marlowe's plays, not much need be said here, unless it be to draw the attention of the student to the astonishing inequality of the workmanship. The first two acts, in Hallam's judgment, are "more vigorously conceived, both as to character and to circumstance, than any other Elizabethan play, except those of Shakespeare," presenting in the Jew Barabas, a character which, if developed on the same scale, would have matched Shylock. Never before had a play opened with a scene charged with such concentrated drama as this of Barabas in his counting-house, contemptuously disparaging as trash the heaps of gold before him, and voicing his insatiable avarice in language that stirs the dullest imagination:

> Give me the merchants of the Indian mines
> That trade in metal of the purest mould;
> The wealthy Moor that in the Eastern rocks
> Without control can pick his riches up,
> And in his house heap pearls like pebble-stones,
> Receive them free and sell them by the weight,
> Bags of fiery opals, sapphires, amethysts,
> Jacinths, hard topaz, grass green emeralds,
> And seld-seen costly stones of so great price
> As one of them, indifferently rated
> And of a carat of this quantity,
> May serve in peril of calamity,
> To ransom great Kings from captivity.

Dignity and beauty characterise the first two acts of this play, revealing Marlowe's genius in maturity. Then follows a lamentable deterioration: the characters become caricatures, the drama buffoonery. Bullen suggests that the play may have been called for at very short notice, and that the last three acts were only roughly sketched out by Marlowe, and filled in by some other person, who took it upon himself to supply the grotesque farcical addition which gave the play its popularity with the vulgar while spoiling it for the fastidious. Whether or not this be the true explanation, it draws attention to one quality in which

Marlowe's genius was entirely deficient—the radiant humour which was one of Shakespeare's most enchanting gifts.

Edward the Second, written, according to Warton, in the year 1590, is the most elaborate of Marlowe's works and is generally agreed to be the best historical play in the language earlier than Shakespeare. Charles Lamb is not unduly enthusiastic when he says:

> The reluctant pangs of abdicating royalty in Edward furnished hints which Shakespeare scarcely improved in his *Richard II*, and the death scene of Marlowe's king moves pity and terror beyond any scene, ancient or modern, with which I am acquainted

Marlowe's Lesser Works

Two other dramatic works by Marlowe remain to be mentioned, *The Massacre at Paris* and *The Tragedy of Dido, Queen of Carthage* (written with T. Nash), but neither of these productions is worthy of the poet's undoubted genius. Perhaps the opinion of Thomas Warton, erudite historian of English poetry, gives the best critical summary of Marlowe's work, especially true of these two plays.

> His tragedies manifest traces of a just dramatic conception; but they abound with tedious and uninteresting scenes, or with such extravagances as proceed from a want of judgement, and those barbarous ideas of the times over which it was the peculiar gift of Shakespeare's genius alone to triumph and to predominate.

Nor must his beautiful fragment "Hero and Leander" be neglected, a poem which, in Swinburne's words, "stands out alone amid all the wild and poetic wealth of its teeming and turbulent age as might a small shrine of Parian sculpture amid the rank splendour of a tropic jungle." Only the first two sestiads are Marlowe's, and these were first published in 1598—a second edition, with the continuation by his friend Chapman, appearing the same year. The poem is a masterpiece of rhymed heroics.

Suggested parallels can all too often be treacherous and misleading. Nevertheless it is difficult to find in all our literature a more interesting study than to read Marlowe's "Hero and Leander," *Edward the Second*, and *The Jew of Malta* side by side with Shakespeare's "Venus and Adonis," *Richard the Second*, and *The Merchant of Venice*.

LESSON 13

Shakespeare: Greatest Poet of All Time

If we were to shear away every name in English dramatic poetry but that of Shakespeare, we could still claim for it such pre-eminence, especially in tragedy—the highest form of drama—that not even the glorious art of Greece could be said to transcend it. Indeed, tragedy, which sprang from the worship of the god Dionysus or Bacchus—the altar and the chorus of the pagan temple having their counterparts in the Greek theatre—and rose into supreme poetic form in the tragedies of Aeschylus, Sophocles, and Euripides, may be said to have culminated in the works of William Shakespeare (1564–1616), whose *Hamlet*, *Othello*, *Macbeth*, and *King Lear* are the four greatest tragedies in the world. But it is Shakespeare's unmatched glory that he excelled in both tragedy and comedy.

Plato's Ideal

As Coleridge points out very aptly, Plato in his *Symposium* had, two thousand years earlier, framed "a justification of our Shakespeare" when he argues that "it was the business of one and the same genius to excel in tragic and comic poetry, or that the tragic poet ought, at the same time, to contain within himself the powers of comedy." This in Plato was prophetic, as it laid down a canon utterly opposed by all the ancient critics, and quite unsupported by any example from the Greek dramatists, to whom tragedy and comedy were incompatible elements, having but one quality in common—ideality. To quote Coleridge further:

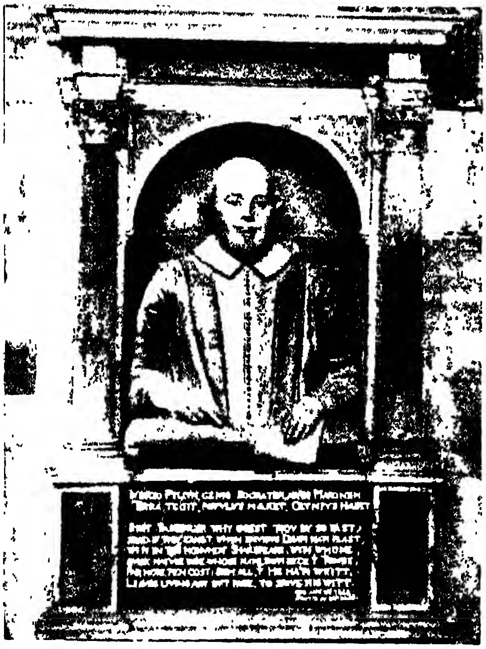
> Both were alike ideal, that is, the comedy of Aristophanes rose to as great a distance above the ludicrous of real life as the tragedy of Sophocles above its tragic events and passions, and it is in this one point of absolute ideality that the comedy of Shakespeare and the old comedy of Athens coincide. In this also alone did the Greek tragedy and comedy unite, in everything else they were exactly opposed to each other. Tragedy is poetry in its deepest earnest, comedy is poetry in unlimited jest.

Thus it could be seen at one glance why Shakespeare's was the one intellect which, while comprehending all human passions and emotions, could equally express all.

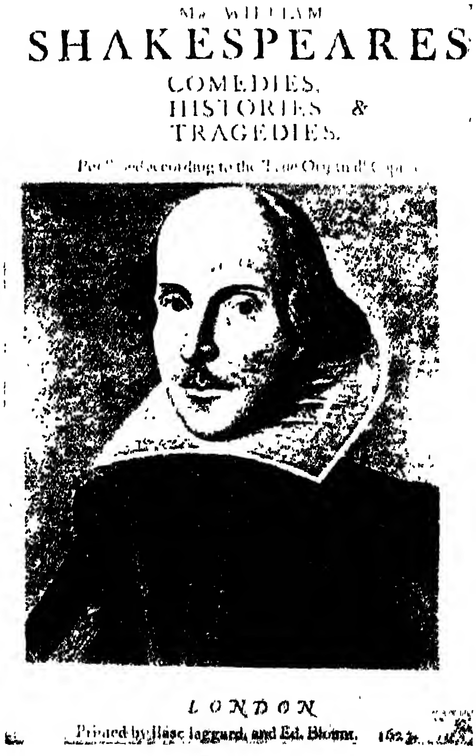
Shakespeare the Inexhaustible

No one will expect to find here anything so audacious as an effort to condense within a page or two a study of Shakespeare. Betterton, the first great tragedian, at the end of his career, when performing Hamlet for the last time, said that he had seldom in fifty years, and with all his continuous study, discharged that rôle without finding in the character some new beauty. If this be true of only one of the multitude of characters created by Shakespeare one might devote a lifetime of study to his works and leave them unexhausted at the end. Nay, many men of great and original talent have done

SHAKESPEARE'S THEATRE. View of Southwark engraved in 1611, the year of Shakespeare's death, showing the Globe theatre, where Shakespeare acted and in which he held shares. Built of wood in 1599 and holding 1,200 people, it was burnt in 1613, then rebuilt the following year, and finally pulled down in 1644.



THE STRATFORD BUST. This portrait bust of Shakespeare, erected over his grave in Holy Trinity Church, Stratford-on-Avon, was the work of Gerard Janssen, a Southwark monumental mason of Dutch ancestry, in 1616. Said to have been modelled from a death mask, it is touched with colour and gilt.



THE DROESHOUT PORTRAIT. No portrait of Shakespeare painted during his lifetime is known to exist, but this engraving by Martin Droeshout (right) appeared on the title-page of the First Folio edition of the plays (1623), and was commended by Ben Jonson.
(British Museum)

so, and many more will do the same. Shakespeare is not only to be regarded as a great author and a department of study, but as a life and a literature.

So limitless is the literature which has grown around the name of Shakespeare in all the languages of European culture that only a man of the ripest scholarship and linguistic attainments can hope ever to obtain more than a partial knowledge of this mighty genius. But that should in no way deter anyone from entering upon the study and enjoyment of a series of works which, if one read no others, would furnish the mind with the very essence of intellectual joy. It is not the least of Shakespeare's distinctions that he commands the devotion and life-long service of the best scholars, while he entertains the most ordinary reader and the common playgoer.

The Man Himself

Although it is often said that some half-dozen facts are all that is known of the poet's life, the untiring industry of biographers and critics, especially during the last century, has supplemented the few historical facts with so much inferential knowledge that there is no difficulty in realizing for ourselves an adequate conception of the man, and in understanding the poet, to the best of our individual capacities.

Almost alone among the Elizabethan dramatists Shakespeare was not a university scholar, but it is fair to suppose that he received his education at the free school of Stratford, being under fourteen years of age when his father, who had hitherto been prosperous and prominent in the public life of the town, fell upon evil times and had to withdraw his son in order to put him to a trade. It has been thought that the boy was apprenticed to a butcher, though some critics, on the strength of the legal knowledge displayed in his works, have supposed that he may have been for a time an attorney's clerk.

Actor and Playwright

He was not eighteen when he married Anne Hathaway, a yeoman's daughter, eight years older than himself; and three or four years later, now the father of three children and a social failure in his own town, he came to London, where in 1592 we find him an actor and a rising playwright. It is in this year that Greene, in his *Groatsworth of Wit*, gibes at him as a "rude groome," who "supposes he is as well able to bumbast out a blanke verse as the best of you"— the sneer of a practised dramatist at a younger and more promising member of his craft.

Shakespeare attained to no great distinction as an actor, but his connexion with the stage brought him in the way of literary work such as altering old plays, retouching the writings of other dramatists when the manager employing him desired to revive their plays. Playwrights were then in the habit of selling to the theatrical managers for a few pounds the entire copyright of their plays, and as actors thought it prejudicial to their interests that the plays should be published, only a few plays of the period were printed, chiefly in unauthorised versions, during their authors' lifetimes.

Chronology of the Plays

The chronology of Shakespeare's early plays has undergone many changes at the hands of different critics, but there is no great difficulty in deciding upon the approximate order of the thirty-seven plays attributed to him, or in distinguishing those of which he was only partly author. As Sir Sidney Lee observes:

> The subject-matter and metre both afford rough clues to the period in his career to which each play may be referred. In his early plays the spirit of comedy or tragedy appears in its simplicity; as his powers gradually matured, he depicted life in its most complex involutions, and portrayed with masterly insight the subtle gradations of human sentiment and the mysterious workings of human passion. Comedy and tragedy are gradually blended, and his work finally developed a pathos, such as could only come of ripe experience. Similarly, the metre undergoes emancipation from the hampering restraints of fixed rule, and becomes flexible enough to respond to every phase of human feeling.

The Early Poems

For this reason the works of Shakespeare are best read in something like chronological order. It is well, therefore, not to begin with the plays, but with the two long narrative poems, "Venus and Adonis" and "The Rape of Lucrece," as the former, published in 1593, was almost certainly the first effort of Shakespeare's muse, and the latter, appearing in the succeeding year, did much to establish the fame of the young play-actor, whose name was becoming familiar to patrons of the theatre as an adapter of plays. These were the works which first won him renown among his contemporaries, and, apart from their great poetic beauty, they are interesting to us for that reason. They are elaborately classical both in matter and in manner, typical of what is called the Pagan Renaissance. Both poems are dedicated to Shakespeare's youthful patron and friend Henry Wriothesley, 3rd Earl of Southampton, who is also depicted in the Sonnets. "Venus and Adonis" is erotic almost to the point of licence, but the exuberant fancy of the poem, the sensuous beauty of its imagery, and its rhythmic sweetness give it distinction. Its success was so great that in the nine subsequent years it went into seven editions.

"The Rape of Lucrece," which deals with the tragic story of the lawless passion of Tarquin's son for the chaste and devoted wife of Collatinus,

was that "graver labour" which the poet promised in his dedication of the first work. It gives evidence of such maturity in its reflective passages, and so great an increase of art in its whole conception and construction, that there is good reason for supposing "Venus and Adonis" to have been an effort of the poet's youth, considerably ante-dating even the first of his attempts at play revising. At all events, these two poems, if read before the plays, will help to the better understanding of the unfolding of Shakespeare's genius.

LESSON 14

A Brief Outline of Shakespeare Study

IN the preceding Lesson it was stated that the chronology of the plays of which Shakespeare was the author, in whole or in part, could be approximately determined by their subject-matter and metre. The Table below lists the plays as they have been arranged by Sir Sidney Lee. Those marked with an asterisk are those of which Shakespeare was only part author.

1. Early Dramatic Work	
Love's Labour's Lost	1591
Two Gentlemen of Verona	1591
The Comedy of Errors	1592
Romeo and Juliet	1592
*King Henry the Sixth (Part I)	1592
*King Henry the Sixth (Part II)	1592
*King Henry the Sixth (Part III)	1592
King Richard the Third	1593
King Richard the Second	1593
*Titus Andronicus	1593
The Merchant of Venice	1594
King John	1594
2. The Development of Dramatic Power	
A Midsummer Night's Dream	1594-5
All's Well that Ends Well	1595
The Taming of the Shrew	1595
King Henry the Fourth (Part I)	1597
King Henry the Fourth (Part II)	1597
The Merry Wives of Windsor	1597
King Henry the Fifth	1598
3. Maturity of Genius	
Much Ado About Nothing	1599
As You Like It	1599
Twelfth Night	1600
Julius Caesar	1601
Hamlet	1602
Troilus and Cressida	1603
4. The Highest Themes of Tragedy	
Othello	1604
Measure for Measure	1604
Macbeth	1606
King Lear	1607
*Timon of Athens	1608
*Pericles	1608
Antony and Cleopatra	1608
Coriolanus	1609
5. The Latest Plays	
Cymbeline	1610
The Winter's Tale	1611
The Tempest	1611
*King Henry the Eighth	——

It is not suggested that the student of Shakespeare is to procure himself a good edition of the plays and poems and read them through precisely in the order given above. But it is well, so far as it may be practicable, to read Shakespeare with more regard to the chronological order of the plays than to their grouping as comedies, histories, and tragedies—the arrangement adopted in so many popular editions.

Many influences will control the reading of the plays, especially theatrical representation, for no student of Shakespeare should miss any opportunity of seeing his plays performed by good companies, and there are few towns of any considerable size where such opportunities do not occur occasionally. He is a poet for both the stage and the study.

Reading and Seeing

It will sometimes happen that the reader may have an opportunity of seeing a Shakespeare play which he has not read, and which, if he were following the above order of reading, he would not be likely to read for some time. The opportunity must not be lost, more especially if it be to witness one of the plays less frequently staged, such as *Cymbeline* or *Coriolanus*.

The play should be read before seeing the theatrical representation of it, and again immediately afterwards. Following this course, one will be struck by the revelation of the subtler passages which results from witnessing a play, already familiar by reading, in its natural atmosphere of the stage. It was said of a great tragedian that to see him act was like reading Shakespeare by flashes of lightning. The phrase was not quite happy, as it is not good to read anything by lightning flashes. But what the critic meant was true: that the actor often interprets passages of the poet, which thus become illumined as by a flash of bright light, to the student, who may have missed their significance when reading the play for himself.

In very few of the popular editions of Shakespeare's plays is any hint given as to the sources whence the poet derived his subjects—sometimes, indeed, his very thoughts and words. But no adequate understanding of Shakespeare can be arrived at without these data, and the reader is counselled to study Shakespeare in some of those editions which give each play in a separate volume, with an introduction and notes by a competent scholar, sometimes giving

the full text of the original stories from which the poet has drawn the foundations of his work.

It is in this way that a true critical estimate of the dramatist may be formed ; but at the same time the student should not place himself unreservedly in the hands of the critics and commentators. It is always better, no matter what blunders may be made in the first instance, for him to come by his own opinions in his reading, through the exercise of his own intelligence. What one finds out for oneself is of far more value than what has been received from any teacher.

Place of the Commentators

In Shakespearean study a vast amount must inevitably be accepted from the expositors of his text, but in doing so, each reader can at the same time cultivate his own critical faculty ; and to this end he cannot do better than read a play for the first time in an edition which is not annotated. In this way he is forced to form some independent judgment, and it is relatively of very little importance whether that judgment be right or wrong ; the conscious effort has been made, and only thus can critical aptitude ever be attained.

After the student has received his own personal impressions of the poet's appeal to his understanding, and has formed his own opinions of the work, he can, with far more profit, place himself in the hands of a scholarly editor, whose notes, elucidations, and parallel quotations will enable him to shape in his own mind an adequate conception of the poet's works, from which he may eliminate any mistaken notions formed in the first unguided reading, while still retaining the tested results of independent judgment. Indeed, this method of reading is not limited in its application to the study of Shakespeare, though it is better adapted to the study of the dramatists and the poets generally than to the writers of prose.

When to Read the Sonnets

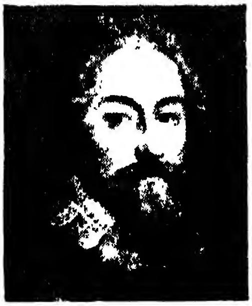
Shakespeare can best be understood by following the sequence of his works. His Sonnets (an example was given in Lesson 4) should be read with the plays of his second period, as most of them were written in the year 1594, though the collection was not published until 1609. Extraordinary interest has centred in these, the only other important work of Shakespeare's pen, and a whole library of books has been devoted to the discussion of the "mystery" of the sonnets ; but it is neither possible nor necessary to deal with the subject here.

The tale of Shakespeare's works from 1592 until his final retirement to Stratford in 1611, supplies most that we know of his life. He had become part owner of the Globe Theatre, the leading London playhouse, in 1599. His income, which in his later years must have been about £600 per annum in the money of the time —equal to at least £7,000 or £8,000 to-day was derived chiefly from his share in this theatre. Two years earlier he had purchased New Place, in Stratford-on-Avon, where he died, April 23, 1616.

LESSON 15

Master Dramatists of the Elizabethan Age


Ben Jonson


Francis Beaumont


John Fletcher


Philip Massinger

THE greatness of Shakespeare could not be better illustrated than by contrast with **Ben Jonson** (*c.* 1573–1637). In almost any age Jonson would have been accounted a writer of the most extraordinary parts. His scholarship was profound—indeed, Shakespeare's learning is by comparison almost superficial—but in all his serious efforts to produce a supreme dramatic work he gives evidence of scholarship only, and not of that divine, ineffable quality which makes the poetry of Shakespeare as harmonious a part of the world's intellectual

life as seed-time or harvest is of its physical life.

It is hard to determine how Jonson came by his vast learning, for there is evidence of only a few weeks spent at St. John's College, Cambridge, in his sixteenth year, after leaving Westminster School. In his youth he worked for a time, to his never-forgotten disgust, at his stepfather's trade of bricklaying, and he was a soldier in the Low Countries when only eighteen years of age. It has been asserted that at nineteen he returned to Cambridge and completed his studies, but this theory rests rather on the desire to explain his wonderful knowledge of the Latin poets than on evidence. He was as injudicious as his great contemporary in contracting an early marriage.

Perhaps poverty, as much as inclination, led him to become an actor. His acting seems to have been undistinguished.

Steeped in the works of the pagan poets, his native genius was undoubtedly more lyrical than dramatic in inspiration, though he gives evidence of a certain saturnine temper which, inclining to tragedy but modified by the former impulse, expresses itself in satire. It was with a comedy, however, that he first essayed to win success on the stage, and *Every Man in His Humour*, produced in 1596 and performed two years later by the company of which Shakespeare was a member, secured a popularity which led to his following it with a second play, entitled *Every Man Out of His Humour*.

Where Jonson Fails

Both are admirable comedies. Like his two tragedies, *Sejanus* and *Catiline*, they follow classical models ; but the author is so obviously subjected to the strict rules of classical composition that his work lacks spontaneity and natural grace in the comedies and tenderness in the tragedies. All his plays are overlaid with the weight of his learning, made coldly accurate by the careful observing of his models ; and neither in tragedy nor in comedy does he sound the depths of human emotion. Though character is always perfectly observed and represented, Jonson fails to reveal the hidden springs, as Shakespeare, less by art than by intuition, does. For these reasons Jonson's dramatic works earned small popularity in his time, and, with rare exceptions, have ever since been dead to all but students of literature. *Every Man in His Humour* has occasionally been revived on the stage, but never with lasting success. More rewarding, perhaps, to 20th-century audiences, as to 20th-century readers, have been *The Alchemist* and *Volpone, or the Fox*, both of which offer superb leading character parts.

Other notable plays by Jonson are *Epicoene, or The Silent Woman* and *Bartholomew Fair*, the latter a violently satirical attack on Puritanism.

Such prosperity as Jonson enjoyed came from the composition of masques, which were a favourite amusement of the court and the aristocracy. The masque is a form of stage entertainment midway between a pageant and a play. During the reign of Elizabeth I it rose to extreme popularity, and most of the dramatists (though not Shakespeare) set themselves to supply their lordly patrons with such entertainments. They were written in both prose and verse, the dialogue being interspersed with songs, and they afforded opportunities for the display of gorgeous costumes and scenic decoration quite foreign to the stage of the time, where no attempt was made at scenic effect or accuracy of make-up. Women also took part in these private theatricals, whereas on the stage all the feminine parts were played by boys or young men.

The finest example of this class of poetic composition is Milton's *Comus*, written for the Earl of Bridgewater and acted at his residence, Ludlow Castle, in Shropshire, on Michaelmas night, 1634. In *Comus* the masque, as an actual entertainment, may be said to have culminated, for it died out under the Commonwealth and has never been revived.

Some of the best specimens of Jonson's verse are to be found in his masques, including the lovely "Hymn to Diana," from *Cynthia's Revels*.

Jonson, in his personal character, had some traits which suggest likeness with his great near-namesake of the 18th century, and "rare Ben" certainly anticipated Samuel's satirical treatment of the Scots. He came near to having his ears clipped for making fun of King James's countrymen in *Eastward Ho !*, a drama in which he collaborated—a rare thing for him, for he was vain of his personal achievement—with Chapman and Marston. He died on August 6, 1637, having experienced loss of friends and favour in his later years. His gravestone, in Westminster Abbey, is inscribed, "O Rare Ben Jonson."

Beaumont and Fletcher

Collaboration was a favourite method of work among the Elizabethans. The most noteworthy example of the practice was furnished by Beaumont and Fletcher, who were so intimately associated in their lives that they had house and clothes in common. Both were of gentle birth, scholars, and men of genius. Their plays—chiefly comedies—were even more popular than those of Shakespeare, being, if anything, more in harmony with the temper of the period.

Francis Beaumont (1584–1616) probably made the acquaintance of **John Fletcher** (1579–1625) at the meetings at the celebrated Mermaid tavern, frequented by Shakespeare, Jonson,

and the wits of the time. as celebrated by Beaumont in his verses to Jonson:

> What things have we seen
> Done at the Mermaid ! heard words that have been
> So nimble, and so full of subtle flame,
> As if that every one from whence they came
> Had meant to put his whole wit in a jest,
> And had resolved to live a fool the rest
> Of his dull life

Together Beaumont and Fletcher wrote *The Knight of the Burning Pestle*, *The Maid's Tragedy*, *Philaster*, and many other plays. Fletcher had usually the greater share in the composition of the plays which bear their joint names, and alone he wrote at least twenty, including the lovely *Faithful Shepherdess*. Shakespeare is supposed to have collaborated with him in *The Two Noble Kinsmen*, while Fletcher also had a hand with Shakespeare in the writing of *King Henry the Eighth*.

It is hard to differentiate between Beaumont and Fletcher, though it seems easy enough by comparing their individual and their joint productions ; but perhaps it is not wrong to say that the one had a more strongly marked lyrical gift, while the other was essentially dramatic in his inspiration. Both men were immensely popular with their contemporaries, and theirs will ever remain among the great names of Elizabethan drama.

As an interesting summary of the most important characteristics of the two famous collaborators, the following passage from Thomas Campbell's *Specimens of the British Poets* cannot be improved upon :

> There are such extremes of grossness and magnificence in their dramas, so much sweetness and beauty, interspersed with views of nature either falsely romantic or vulgar beyond reality ; there is so much to animate and amuse us, and yet so much that we would willingly overlook, that I cannot help comparing the contrasted impressions which they make to those which we receive from visiting some great and ancient city, picturesquely but irregularly built, glittering with spires and surrounded with gardens, but exhibiting in many quarters the lanes and haunts of wickedness. They have scenes of wealth and high life, which remind us of courts and palaces frequented by elegant females and high-spirited gallants, whilst their old martial characters, with Caractacus in the midst of them, may inspire us with the same sort of regard which we pay to the rough-hewn magnificence of an ancient fortress

LESSON 16

Some Minor Contemporaries of Shakespeare

Many names must now be dismissed briefly, though most of them are almost as worthy of some detailed notice as are Beaumont and Fletcher.

Philip Massinger (1583 1640), who was laid in the same grave as Fletcher, at St. Saviour's, Southwark, was so associated with him and other dramatists in playwriting that it is difficult to appreciate his individual work. But he is no less gifted in comedy than Beaumont and Fletcher, and in tragedy he displays real power. The only play by him that has held the stage is *A New Way to Pay Old Debts*, a brilliant and mordant comedy.

John Ford (1586 *c.* 1640) was a dramatist of real tragic power, to whom only the darker emotions of the heart seemed to appeal. His plays are sombre and unredeemed by the finer feelings of fancy and imagination. His *Perkin Warbeck* is a good historical drama, and *'Tis Pity She's a Whore* is a remarkable tragedy. He collaborated in several plays, notably *The Witch of Edmonton*, with **Thomas Dekker** (*c.* 1570-1641), a prolific and able writer of both tragedy and comedy. *The Shoemaker's Holiday* and *Old Fortunatus* are Dekker's best-known comedies.

Dekker, in turn, was associated with **John Webster** (*c.* 1580–1625), of whose life hardly anything is known. Webster was a dramatist of extraordinary power in tragedy, and over his works gloom, profound and chilling, seems ever to brood. *The Duchess of Malfi* must rank with the finest of the period ; but it is easy to understand why he had scant favour with contemporary audiences.

Thomas Middleton (1570-1627) wrote many charming comedies, while **William Rowley** (*c.* 1585–*c.* 1642), an actor-playwright of no remarkable qualities, collaborated at various times with the last-mentioned five dramatists, and also with **Thomas Heywood** (*c.* 1570-1641), who claims to have had a large share in the writing of 220 plays up to the year 1633. *A Woman Killed with Kindness* has real pathos and simplicity to distinguish it, and is possibly the best of Heywood's plays.

John Marston (*c.* 1575-1634) was a poet of most unequal achievement, associated with Jonson and **George Chapman** (1599-1634) in the production of *Eastward Ho !* Chapman was greater in comedy than in tragedy. *All Fools* is an excellent play of the former class, but his tragedies are usually marred by bombast and fustian. His great achievement was the translation of Homer's *Iliad* and *Odyssey* into rhymed verse of fourteen and ten syllables respectively. These translations, despite numerous faults, are in many ways unsurpassed by Pope's more familiar versions of the same works.

James Shirley (1596–1666) represents the last of this school of dramatists, for, though he was but a boy when the reign of Elizabeth ended, his early associates were the later Elizabethans, and

all the influences on him were Elizabethan ; he had come to manhood at the time of Shakespeare's death. Charles Lamb says of him :

> James Shirley claims a place among the worthies of this period, not so much for any transcendent talent in himself, as that he was the last of a great race all of whom spoke nearly the same language, and had a set of moral feelings and notions in common A new language and quite a new turn of tragic and comic interest came in with the Restoration

This, rather than Campbell's somewhat perfervid panegyric of the dramatist, is a proper view of Shirley, for while the tragic and pathetic passages of his plays, which are chiefly tragicomedies, are often distinguished by great tenderness and true feeling, he fails on the whole to rise to the level of his models, Beaumont and Fletcher and Ben Jonson. Of his thirty-odd plays *The Lady of Pleasure*, designed on the lines of Massinger's *City Madam*, and his tragedy, *The Traitor*, have been justly commended. As a writer of masques (*The Triumph of Beauty*, *The Triumph of Peace*) he is second only to his "acknowledged master," Ben Jonson.

On the student's knowledge of, and sympathy with, the poets from Chaucer to Shirley will depend much of his understanding of English literature. The Elizabethans, especially, are the beacon lights of the English spirit, if the metaphor will pass. To know them well is to have the whole character of England illumined. They represent more directly than any body of writers in England, before or since, the spirit of their time and country. This may be thought an overstatement, when it is recalled how the spirit of the 18th century is reflected in writers of the period. But that was not the real genius of England. It was a passing phase ; whereas the spirit of the Elizabethan age is the very pulsing of England's heart.

In a sense the Elizabethans are more in touch with the 20th century than are the writers of the 18th century. Indeed, even the literature of the Victorian age, rich in abundance though it is in great writers and in great works, is not so thoroughly in tune with the English spirit as is that of the first Elizabethan age. To take only one illustration : the women lively, courageous, independent in thought, speech, and action, yet none the less gracious, virtuous, and charming who are depicted in the plays of Shakespeare and his contemporaries are surely nearer to the present-day ideal of Englishwomen than the inhibited Victorian miss of the 19th-century novels.

The creators of the great Elizabethan literature were poets to a man, and the poet is ever the truth-teller. He is not so apt to temporise with passing moods and whims as is the writer of prose. He utters himself with greater freedom, because "It is in me, and shall out."

It was the glory of the Elizabethan age to be the epoch in which there lived, surely by no mere chance but inevitably, a splendid company of poets whose poetry enshrines for all time the English spirit—patriotism, heroism, idealism, the love of liberty, beauty, nature, domesticity.

The Elizabethan poets since, for all their superiority to the multitude, they were still men of their time—necessarily reflect in their writings the looseness of their age in the treatment of morals. And it is Shakespeare again who towers above his glorious company of contemporaries in his comparative freedom from grossness. By that token he is really less the mirror of his age—but perhaps more the mirror of the English spirit - than, for example, Beaumont and Fletcher. He is the most modern writer in our language. It would seem that in one fruitful moment the genius of England gave birth to a poet who interpreted his country to itself and to the world once and for all time ; his thoughts and language are the everlasting mind and utterance of the English breed at their highest level. He helped to form the English language by shaping everlasting phrases which have become so much of the English language as to be accepted as an integral part of English thought ; hence it is almost impossible to speak on any subject for long without quoting Shakespeare, consciously or unconsciously. His phrases have become "household words"—and that itself is a Shakespearean phrase !

The significance of the Elizabethans is aptly expressed in the summary with which Taine begins his study of the theatre in his *History of English Literature* :

> Forty poets, among them two of superior rank, as well as one, the greatest of all artists who have represented the soul in words ; many hundreds of pieces, and nearly fifty masterpieces ; the drama extended over all the branches of history, imagination, and fancy—expanded so as to embrace comedy, tragedy, pastoral and fanciful literature—to represent all the degrees of human invention—to express all the perceptible details of actual truth, and all the philosophical grandeur of general reflection - the stage disencumbered of all precept, and freed from all imitation, given up and appropriated in all the minutest particulars to the reigning taste and public intelligence ; all this was a vast and manifold work, capable by its flexibility, its greatness, and its form, of receiving and preserving the exact imprint of the age and the nation

Such is the fine flowering of the most important of all periods of English literature, not to the student only, but to the general reader who desires a knowledge of the great English literary heritage.

English dramatic form from this period on increasingly forsook the realm of poetry for that of prose, and the story of its later development can conveniently be postponed until a later stage in these Lessons, which meanwhile will continue to deal with the development of English poetry from the 17th century to the 20th century.

LESSON 17

Poetry in the Age of Milton

THE greatest name among the poets of the age that witnessed the rise of the Commonwealth and the downfall of the Stuart kings is that of **John Milton** (1608-74).

Milton, "God-gifted organvoice of England," was the son of a scrivener who had been disinherited by his father for changing his faith to that of the Reformers. He wrote verses at the age of ten, and paraphrases of the Psalms (including the well-known "Let us with a gladsome mind") as a schoolboy, yet in the sonnet "On Arriving at the Age of Twenty-Three," he is found lamenting his "late spring." His early poems were chiefly inspired by the pastoral surroundings of Horton, in Buckinghamshire, where, after leaving Cambridge, he spent five years under the parental roof. "L'Allegro" and "Il Penseroso" are mirthful and pensive poems respectively, as their titles imply. Each has supplied the world with many oft-quoted phrases and lines. Among many familiar lines in the former is the couplet:

> Come and trip it as ye go
> On the light, fantastic toe

In the latter is the phrase "the cricket on the hearth," and the well-known reference to

> . . . Storied windows, richly dight,
> Casting a dim religious light.

Comus is a masque, beneath the exquisite allegory of which may be discerned the poet's political bent, and the whole is rich with promise of his later work. "Lycidas" is an elegiac poem composed in memory of a college friend. Some passages in this poem breathe such a contempt for the corrupt holders of ecclesiastical benefices as to make one wonder why it was not made the subject of a Star Chamber inquiry. Here are some grand lines from "Lycidas":

> Alas ! what boots it with incessant care
> To tend the homely, slighted shepherd's trade
> And strictly meditate the thankless Muse ?
> Were it not better done, as others use,
> To sport with Amaryllis in the shade,
> Or with the tangles of Neæra's hair?
> Fame is the spur that the clear spirit doth raise
> (That last infirmity of noble mind)
> To scorn delights, and live laborious days ;
> But the fair guerdon when we hope to find,
> And think to burst out into sudden blaze,
> Comes the blind Fury with the abhorred shears
> And slits the thin-spun life . . .

Having pondered these poems, the student should read the beautiful lines, "At a Solemn Musick." The works mentioned were composed between the years 1631 and 1637, when, to quote the words of Sir Edmund Gosse, Milton "contributed to English literature about two thousand of the most exquisite, the most perfect, the most consummately executed verses which are to be discovered in the language."

Paradise Lost is the best known of all Milton's writings. Though owing something, doubtless, to Spenser's *Faerie Queene*, it is not only the first English epic ; it is unapproached. There are various forms of this particular class of poetry ; its foreign masters are Homer, Virgil, Tasso, Ariosto, and Dante. Milton's original conception was of a drama on the Arthurian legends. Perhaps the Civil War which intervened between the conception and the performance of the work supplied sufficient motive for a theme of a more sublime and solemn character than even that associated with the Round Table. But, as Milton's great editor Professor David Masson, reminds us, Milton inherited, as it were, a subject with which the imagination of Christendom had long been fascinated.

Epic Without Parallel

Paradise Lost is more than the outpourings of a richly stored mind saturated in the classics and the Bible. It is an epic that has no parallel in our own or in any other language. As Professor Masson says:

> It is an epic of the whole human species—an epic of our entire planet, or, indeed, of the entire astronomical universe. The title of the poem, though perhaps the best that could have been chosen, hardly indicates beforehand the full nature or extent of the theme ; nor are the opening lines, by themselves, sufficiently descriptive of what is to follow. It is the vast comprehensiveness of the story, both in space and time, that makes it unique among epics, and entitled Milton to speak of it as involving
>
> "Things unattempted yet in prose or rhyme."
>
> It is, in short, a poetical representation, on the authority of hints from the Book of Genesis, of the historical connexion between human time and aboriginal or eternal infinity, or between our created world and the immeasurable and inconceivable universe of pre-human existence.

Milton's "Ode on the Morning of Christ's Nativity," written in his Cambridge days, conveyed the theory that the pagan gods were fallen angels. *Samson Agonistes* was his last work. It is a drama founded on the Book of Judges, but, as the author expressly states, not designed for the stage. It is the work of one whose cause had been nobly fought for and hardly lost. The thoughts uttered by Samson come from the heart of the poet. The work is severe in style, and derives its highest interest from the parallels it offers between the lives of Samson and Milton himself.

It is impossible to over-estimate the importance of the study of Milton's work to all who aspire to the proper and most effective


John Milton


Sir John Suckling


Sir Richard Lovelace


Samuel Butler

use of their native language. To Milton may be ascribed Spenser's eulogy of Chaucer as "a well of English undefyled."

The minor poets who were Milton's contemporaries will be considered very briefly. **Thomas Randolph** (1605-35) was one of the young writers who were honoured with the title of his "sons" by Ben Jonson. The author of several plays, mostly in verse, as well as of a quantity of other poetry, he has a good deal of fancy and his verse flows melodiously, but in general his poetry has a bookish and borrowed air, and need not detain any but the advanced student. **Edmund Waller** (1606-87) was the most celebrated among the minor poets of the period between the Restoration and the Revolution. Of weak character, he was incapable of feeling or expressing any very generous emotion, and his poetry seldom or never strikes a powerful note ; yet his verse abounds in ingenious thoughts, dressed to great advantage and exhibited with great transparency of style. Waller is remembered to-day only as the author of "Go, Lovely Rose" and "Lines on a Girdle"—lyrics which, as his editor Thorn Drury says, "might almost be chosen from English literature to serve as examples of the charms of simplicity and directness."

Sir John Suckling (1609-42) was the author of a small collection of poems and of four plays. Fluent and graceful, he has a sprightliness and buoyancy all his own. He is saved from oblivion by a song beginning "Why so pale and wan, fond lover ?" and his ballad of "The Wedding" the very perfection of gaiety in verse, containing the pretty simile :

> Her feet beneath her petticoat
> Like little mice crept in and out
> As if they feared the light.

Sir Richard Lovelace (1618-58) wrote two small volumes of pleasant songs and other short pieces, mostly amatory. Among them are the poems "To Lucasta, on Going to the Wars," which includes the oft-quoted

> I could not love thee (Dear) so much
> Lov'd I not honour more.

and "To Althea, from Prison," the last stanza of which begins with the lines so often quoted :

> Stone walls do not a prison make,
> Nor iron bars a cage.

Sir John Denham (1615-69) is the author of a contemplative poem, "Cooper's Hill," which supplies, under the influence of Waller, an early model of the rhythmical couplet.

Richard Crashaw (1613-49), author of "The Flaming Heart," was a mystical poet of the highest order, who influenced Coleridge, Shelley, and Swinburne. In his own day he was eclipsed by his friend **Abraham Cowley** (1618-67), than whom few poets have been more praised in their lifetime. Cowley belonged to what Jonson called the "metaphysical" school of Donne, of which mention has been made in earlier Lessons, and indeed was in the main a mere modernisation and dilution of Donne, somewhat less forced and fantastical, much less daring, but unfortunately also much less poetical. Considerable grace and dignity, however, occasionally distinguish his Pindaric Odes, and there is playfulness of style and fancy in his translations from, and imitations of, Anacreon. To-day, however, Cowley is chiefly read for his prose.

Samuel Butler (1612-80), in his inimitable satiric poem *Hudibras*, which was written in ridicule of the Puritans, displays much learning as well as wit, and not infrequently a surprising beauty of both thought and expression, while his epigrammatic sayings are most happily phrased. **Andrew Marvell** (1621-78) was a friend of Milton, played the part of laureate during Cromwell's life, and wrote a "Horatian Ode upon Cromwell's Return from Ireland," which Trench specially commends to English students of Horace. Marvell's lines on "The Emigrants in the Bermudas" and those entitled "To His Coy Mistress" are even better known than the Horatian ode, while "The Garden" is to-day widely quoted. **Henry Vaughan** (1622-95) was a follower of George Herbert. His poetry is unequal in its quality, but he wrote some lovely elegies, and "The Retreat" may be regarded as a forerunner of Wordsworth's "Intimations of Immortality."

LESSON 18

Dryden and Pope

John Dryden

Alexander Pope

James Thomson

Thomas Gray

SECOND in importance only to that of Milton in the 17th century is the name of **John Dryden** (1631–1700). He excelled as a dramatist and as a writer of prose, but the concern of this Lesson is with his poems. His dramatic work will be considered in a later Lesson. One of the first of his characteristics to strike the reader is his alertness to the significance of events in the world outside his library. Witness his "Annus Mirabilis" (the wonderful year of 1666), wherein he celebrates the English victories over the Dutch at sea and the benefits of the Great Fire of London.

In "Absalom and Achitophel" Dryden directed the whole weight of his powerful intellect to the undoing of the Earl of Shaftesbury's scheme for inducing Charles II to nominate his illegitimate son, the Duke of Monmouth, as successor to the throne against the lawful claim of the king's brother, James, who was a Romanist. At this time, it should be remembered, Dryden, though soon to adopt the Roman faith, was strongly Protestant, as may be proved by reference to "Religio Laici," the work that followed "Absalom and Achitophel." Taking as his model the story of Absalom's revolt against David, Dryden named the various parties to the Monmouth plot after the characters in the Second Book of Samuel. The portrait of Shaftesbury, beginning:

> In friendship false, implacable in hate,
> Resolved to ruin or to rule the State

is the most telling example of passionately concentrated portraiture in literature.

Three other works by Dryden exhibit his splendid lyrical ability—the "Ode to the Memory of Mrs. Anne Killigrew," described by Johnson as the noblest in the language; the "Song for St. Cecilia's Day"; and "Alexander's Feast." Dryden's translations from Homer, Virgil, Ovid, Juvenal, and Boccaccio are subjects for advanced study. One of his chief claims to attention is that directness and vigour of his language which almost any half-dozen lines in his verse would illustrate. James Russell Lowell says:

> Amid the rickety sentiment looming big through misty phrase which marks so much of moder literature, to read Dryden is as bracing as a no h-west wind. He blows the mind clear In ripeness f mind and bluff heartiness of expression he takes rank with the best. His phrase is always a short cut to h s sense He had beyond most the gift of the right word and if he does not, like one or two of the Greek masters of song, stir our sympathies by that indefinable oma, so magical in arousing the subtle associations of the soul, he has this in common with the few great writers that the winged seeds of his thought embed themselves in the memory and germinate there

Of the poets who came between Dryden and Pope in order of their birth, four only can be selected for mention here.

Matthew Prior (1664–1721) wrote a clever parody of Dryden's "The Hind and the Panther," called "The Country and the City Mouse." His muse, as Hazlitt says, was a wanton flirt. His poems and lyrics are marked by an easy air of abandonment, but have at least the merit of originality as well as wit.

Thomas Parnell (1679–1718), author of "The Hermit" and "The Fairy Tale," aided Pope in his translation of the *Iliad* and wrote an "Elegy to an Old Beauty," of which one line is often quoted:

> We call it only pretty Fanny's way.

The "Night Thoughts" of **Edward Young** (1683–1765) have all the gloom but little of the grandeur of "otherworldliness."

John Gay (1685–1732), author of *The Beggar's Opera* (*see* Lesson 35) was also the writer of several delightful songs.

Alexander Pope (1688–1744), bracketed equal with Dryden by his contemporaries, and his successor in the complete mastery of the use of the heroic couplet, is the next great figure to be considered. The son of a London linen

merchant, a Roman Catholic, he was excluded from public school and university by reason of his father's religion. As a result he was in great measure self-taught and self-cultivated. Pope tells us that

> As yet a child, nor yet a fool to fame,
> I lisp'd in numbers, for the numbers came.

Many critics maintain that they came too easily. These are they who hold that Pope's polish is as much a proof of an unpoetic soul as Whitman's ruggedness.

Perils of Satire

Indeed, there is more divergence of critical opinion concerning Pope than with that of any other great poet. This may be due to his being a satirist, and to the merciless manner in which he ridiculed his contemporaries in "The Dunciad," the "Epistles," and his miscellaneous verse, which stirred up those animosities which cloud judgment and replace criticism with passion. Those whom he wounded and all who sympathised with them failed to appreciate his true greatness. That is always the danger for the satirist. When Voltaire built a church at Ferney and dedicated it to God, in all honesty and reverence, as a protest against the innumerable churches dedicated to Peter and Andrew and John and less familiar saints, he was widely contemned as a mocker. Who lives by ridicule shall perish by ridicule; but Pope contrived to do the one and avoid the other, because he had vastly more in him than his unmatched powers of satire. This is shown even in one of his most famous satiric poems, the brilliant, mock-heroic "Rape of the Lock," of which Dr. Johnson said, "It is the most airy, the most ingenious, and the most delightful of all Pope's compositions."

Properly to appreciate Pope, one should know much more of his life and personality than can possibly be illustrated here. Yet the assertion can be made that he is one of the heroic figures in English poetry, and that he is one of the greatest poets, supremely competent in the technique of his art, with a brilliant and comprehending mind, and a heart that could respond to nature and to humanity, despite all the pother one has heard about his artificiality and his heartlessness.

Pope's Heroic Couplets

It has been the fashion—perhaps it is not so now—to sneer at the smooth regularity and the rocking-horse rhythms of Pope's verse. He made the heroic couplet a great and enduring vehicle of expression, which not even the genius of Dryden had achieved for it, and rhythmic regularity is of the essence of the heroic couplet. It is easy to make it appear trivial by reading in a sing-song manner; even the noblest passages of *Paradise Lost* can be turned into toneless prose if read aloud as one would read a newspaper paragraph. There must be in reading, as in witnessing a play, a contribution of make-believe from the reader, who should deliberately lend his ear to the movement of the verse and then submit to the poet's emphasis, pause, and rhythm, if he would have the full pleasure of the verse he is reading.

Pope is a "polished" poet. Sir Edmund Gosse traces this polish to the example of Boileau, the great French satirist, and that may be so; but the whole age of Pope was intent on polishing and making perfect to the point of artificiality. Nor is that altogether a fault. The conscious effort towards perfection is always in itself a good thing, and cannot mislead if the person making the effort has something worth saying. This Pope had in abundance.

Quotable Lines

Next to Shakespeare, Pope is probably the most frequently quoted of poets. A remarkable number of his phrases have become so comfortably embedded in common speech as to be mistaken, as often as not, for ancient proverbs—sure evidence that at least one function of the poet has been successfully fulfilled, that of releasing memorable (and usually, as it seems, final) utterance to common human experience in directions where such experience had not previously been able to give adequate tongue. As Pope himself puts it in a characteristic couplet:

> True wit is nature to advantage dressed,
> What oft was thought, but ne'er so well expressed.

Here are a few examples of Pope's prowess in this respect (and note that each line is an iambic pentameter):

> Hope springs eternal in the human breast
> An honest man's the noblest work of God
> To err is human, to forgive, divine
> Damn with faint praise, assent with civil leer
> Do good by stealth, and blush to find it fame
> A little learning is a dangerous thing
> The feast of reason and the flow of soul
> For fools rush in where angels fear to tread
> The proper study of Mankind is Man

In the poetry of **James Thomson** (1700-48) is heard an echo of that of Spenser. This echo is characteristic of much of the poetry of the 18th century. Thomson may be said to afford relief from the didacticism of Pope by singing of nature sincerely, if in a somewhat affected style. His chief poems are "The Seasons" and "The Castle of Indolence," which prepare the way for the beautiful odes of **William Collins** (1721-1759) and the scholarly writings of **Thomas Gray** (1716–71), whose "Elegy Written in a Country Churchyard" (Stoke Poges) did for "the rude

forefathers of the hamlet" what Pope accomplished for the fashionable folk of the town. Gray wrote little, but what he wrote was written supremely well. He was a man of leisure and refinement, the son—like Milton—of a scrivener. He drew inspiration from Milton and Dryden, and stands out as one of the harbingers of Wordsworth.

Mention may here be made of **Robert Blair** (1699-1746), who wrote a sombre poem called "The Grave," which was still popular in the melancholy Victorian days; of **William Shenstone** (1714-63), whose "Schoolmistress" is a tender tribute to a Leasowes teacher, Sarah Lloyd; and of **Mark Akenside** (1721-70), whose "Pleasures of the Imagination" is a poem too dull and too didactic in character to appeal to the modern reader.

LESSON 19

Poetry Becomes Aware of Nature

If only by virtue of two poems, "The Traveller" and "The Deserted Village," **Oliver Goldsmith** (1728-74) holds an honoured place among the poets of the 18th century. Like Pope, he was a master-exponent of the virtues of the heroic couplet. He could turn a line as deftly as, if with less pointed wit than, Pope, and he excelled the older writer in graceful and illuminating metaphor. Moreover, Goldsmith broke away from Pope's artificiality of diction to the simpler and more natural manner appropriate to his greater humanity and breadth of sympathy.

"The Deserted Village" is one of the most popular poems in the language. It also has its importance as marking a successive reaction from over-conscientious stylism, as well as helping to remove poetry away from the cramping environment of town society to re-discover its inspiration in the humours of rural life. The worst that can be argued against "The Deserted Village" is not that it exploits the art of poetry for the sake of political pamphleteering (against the Enclosures Act), for a work of art may be none the less a work of art by reason of what it has to say; but that for all its air of simple truth it presents after all only an idealised, sentimentalised, townsman's view of the delights of rural existence. In other words, its charm may be a defect, if the reader once feels the charm to be deliberate. The greatest passages, which are also those most significant as portending that "return to nature" which was to culminate in the work of the great Wordsworth, are the pen-portraits, truthfully if not profoundly drawn from affectionate memory, of those village characters, the parson—

> Careless their merits or their faults to scan,
> His pity gave ere charity began—

and the schoolmaster—

> Well had the boding tremblers learned to trace
> The day's disasters in his morning face;
> Full well they laugh'd with counterfeited glee
> At all his jokes, for many a joke had he;
> Full well the busy whisper, circling round,
> Conveyed the dismal tidings when he frown'd.

Goldsmith, born in Ireland, a clergyman's son, spent most of his boyhood at Lissoy, Westmeath—the "sweet Auburn" of "The Deserted Village." After he had left Trinity College, Dublin, he met with little success. He tried the Church, law, and medicine, all with unsatisfactory results. He then wandered eventually about Europe, sometimes as a peripatetic scholar at Continental universities, but more often dependent for food and lodging on the occupants of wayside cottages, to whom he could play the flute. Settling in London in 1756, he was eventually employed as a hack writer for the booksellers. Gradually he achieved a certain repute, which was increased by his one novel, *The Vicar of Wakefield*, and by his two stage comedies, *The Good Natur'd Man* and *She Stoops to Conquer*.

He was ever shy and awkward, regarded by


Oliver Goldsmith


William Cowper


Robert Burns


William Blake

his associates with mingled respect and contempt. But he enjoyed the personal favour and admiration of the great Dr. Johnson, who said of him: "He touched nothing that he did not adorn."

In the words of **William Cowper** (1731–1800), "It is a great thing to be indeed a poet, and does not happen to more than one man in a century." It certainly happened to him. Although his poetry has passed through periods of neglect in the 150 years and more that have gone since his death, it has never been quite under eclipse. It was the religious nature of his work that earned its first great vogue. At the close of the 18th century and in the early years of the 19th the whole middle-class community of England was brought up on Cowper. Yet it was a piece of joyous ballad poetry, "John Gilpin," that first won him popular favour and will longest retain it.

He was fifty-four when he published "The Task," which made him famous. Begun in the winter of 1783, it was written at the suggestion of a friend, Lady Austen. Its success was complete, for here Cowper showed himself in his natural spirit. "The Task" has been said to be a poem about Cowper himself, and although it contains hardly a hint of the tragedy of his life, his ailings, yet his walks, his friends, his abhorrence of slavery, and his religious views are delightfully portrayed therein. The theme and spirit of "The Task" can be epitomised in the single line, "God made the Country, and man made the town."

Within its own limits Cowper's feeling for the beauty of nature and the simple life was more sincere and his representation of it more truthful than Thomson's. His thoughts are those of a recluse, but one who nevertheless loves the domestic hearth and whose ear is no less open to the sounds than are his eyes to the sights of rural life.

Of his shorter poems the lines "On the Receipt of My Mother's Picture," the lines on Alexander Selkirk beginning "I am monarch of all I survey," and the patriotic "Boadicea" and "The Loss of the Royal George" are almost as familiar as his simple, appealing hymns, which include "God moves in a mysterious way," "Sometimes a light surprises," and "O for a closer walk with God." An appreciation of Cowper is to be found in Lord David Cecil's biography *The Stricken Deer*.

Among Cowper's contemporaries were **James Macpherson** (1736–96), the self-styled translator of Ossian; **Charles Churchill** (1731–64), author of the satirical "Prophecy of Famine"; **Michael Bruce** (1746–67), who probably wrote the exquisite lyric, "Ode to the Cuckoo," which has also been claimed for **John Logan** (1748–88); and **Thomas Chatterton** (1752–70), who produced the Rowley forgeries at the age of sixteen, and the exquisite "Balade of Charitie" at eighteen.

> The marvellous boy,
> The sleepless soul that perished in his pride!

Chatterton came to London full of hope and confidence in his precocious powers. He died of starvation and poison in a wretched garret, and was buried in the paupers' pit of Shoe Lane workhouse.

Indeed, when Cowper talks about only one poet per century, he is very wide of the mark. His own century produced Pope, Goldsmith, Burns, and Crabbe in addition to himself.

To **Robert Burns** (1759–96), fame came early, and a sorry business he made of it.

> He left his land her sweetest song
> And earth her saddest story

But the universal renown and affection which have grown for the works and character of Burns since his death are unprecedented in the history of literature. There are good reasons for this. The lyric gift of Burns more nearly touched perfection than that of any English poet before or since. The epithet "English" is used with a full sense of responsibility, because Burns is something more than an Ayrshire bard, and there are objections to the word "British" as applied to matters of taste. There is a further reason for emphasising his English quality, despite what Cowper, who was admired by Burns, called his "uncouth dialect," and it is this.

Burns is a writer of the purest, smooth-flowing English. In all his serious poetry there is hardly one Scottish word. He reserves the Scottish tongue for his lighter moods, his satirical vein; and it is to be observed, in such a poem as "The Cottar's Saturday Night," that as the thought changes in character or deepens in seriousness the language changes also.

> Wi' kindly welcome, Jenny brings him ben;
> A strappin' youth; he takes the mother's eye;
> Blythe Jenny sees the visit's no ill ta'en;
> The father cracks of horses, ploughs, and kye.
> The youngster's artless heart o'erflows wi' joy,
> But blate and laithfu', scarce can weel behave;
> The mother, wi' a woman's wiles, can spy
> What makes the youth sae bashfu' an' sae grave;
> Weel-pleased to think her bairn's respected like the lave.
>
> O happy love! where love like this is found:
> O heart-felt raptures; bliss beyond compare!
> I've pacèd much this weary mortal round,
> And sage experience bids me this declare —
> "If Heaven a draught of heavenly pleasure spare,
> One cordial in this melancholy vale,
> 'Tis when a youthful, loving, modest pair
> In other's arms breathe out the tender tale,
> Beneath the milk-white thorn that scents the evening gale."

Burns himself tells us, in the famous dedication to the noblemen and gentlemen of the Caledonian Hunt, that the poetic genius of his

country bade him sing the loves, the joys, the rural scenes and rural pleasures of his wild, native soil in his native tongue, and he tuned his "artless" notes as she inspired. There has been a tendency to accept him a little too much at his own valuation in that matter of art and artlessness. Actually he is one of the most finished of English poets, and his prose is obviously that of one who is an artist in words. Let it be declared here that he was a conscious artist and no untutored genius of the plough.

It has to be remembered that Burns was no infant phenomenon of the muse. The bulk of the poetry on which his fame is based was written round about the age of twenty-five—by no means an early age for a poet of genius—when his inspiration was at its freshest and his education had been carried far beyond the average of his class, both in reading and in writing. He was already an artist when he made his bid for fame. That is an aspect of the poet which students should consider. Burns was a ploughman, but in the Scotland of his day, and perhaps in the Scotland of to-day, the ploughman may be a man of culture as well as of agriculture. Burns was no counterpart of the English Hodge, plus inspiration. He was a well-educated, bookish young Scotsman of poor but decent parentage, a description that would be true of fifty per cent. of his countrymen

Robert Burns is the peculiar glory of Scotland. There never was a poet at once so local and so universal in his appeal He brought the quality of pity into poetry and stirred it in the hearts of men at a time when the blighting shadows of Calvinism-cum-Knoxism still lay upon Scotland and made its religion bleak and forbidding. For every lowly thing, for all downtrodden unhappy folk, Bürns was full of pity. And that pity has immortal expression in many of his poems, while there is also a wistfulness about much that he wrote that goes straight to one's heart and brings the poet there also.

Although in his birth **George Crabbe** (1754–1832) pre-dates Burns, his principal achievement falls within the 19th century, and Burns had died four years before that opened. "Nature's sternest painter and her best," says Byron: a description that is not free from poetic enlargement, though the first half of the line might safely be accepted. For Crabbe's chief work was to retore a sense of the realities; to smash up the pretty-pretty, meretricious, porcelain stuff that had come to pass as pastoral poetry. This he did lustily, and in fine vigorous verse that pleased the ear while it sustained interest in the pity or the horror of his story. Humour is not Crabbe's strong point, and yet one grows to like the poet by reason of his evident sympathy with the unfortunate subjects of his verse. He is a satirist moved by a passionate attachment to the truth and a warm heart for human suffering, so that while others were seeing nothing but idyllic scenes in rural England-that-never-was—Goldsmith among them—and it was the fashion to pretend that the country life was arcadian in its unalloyed delights, Crabbe in his poem "The Village" could remind us of the sordid realities of "the parish house" in this fashion:

> Theirs is yon House that holds the parish poor,
> Whose walls of mud scarce bear the broken door;
> There where the putrid vapours, flagging, play,
> And the dull wheel hums doleful through the day,
> There children dwell who know no parents' care;
> Parents who know no children's love dwell there;
> Heart-broken matrons on their joyless bed,
> Forsaken wives, and mothers never wed,
> Dejected widows with unheeded tears,
> And crippled age with more than childhood fears;
> The lame, the blind, and far the happiest they!
> The moping idiot and the madman gay.

Influenced by Goldsmith, Gray, and Pope, Crabbe may be considered chief of the early exponents of the rural school and the direct forerunner of Wordsworth. Crabbe is read more for what he says than for his style, which, notwithstanding its vigour, is unequal and frequently faulty. His knowledge of humanity is extensive; and he showed a charming lyric gift when he sought relief from the heroic couplet. "The Parish Register," published in 1807, is perhaps of all his works most worthy of study

The movement away from that "classicism" which had tended to rate an elegant formality of style higher than sincerity of vision and statement, towards a renewed interest in natural things, however humble they might be, is seen again in the work of such lesser poets as **Robert Bloomfield** (1766–1823), a farm labourer turned shoemaker, who wrote in a London garret his "Farmer's Boy," basing his style on that of Thomson's "Seasons", and by the Scots poet **James Hogg** (1770–1835), sometimes called the "Ettrick Shepherd," who stands next to Burns among Scotland's rural poets. To Sir Walter Scott, Hogg once described himself as "king of the mountain and fairy school of poetry"—a fair piece of self-description Among his most popular compositions are "Kilmeny" and "When the Kye Come Hame."

A great name of this period, or a little later, which stands somewhat apart from the rest, as though defying classification, is that of **William Blake** (1757–1827). He represents in some way a "short cut" from the great Elizabethans to Wordsworth. He towers above lesser men of his own day by reason of his imaginative genius, and the authentic accounts of his life prove him, in the light of modern understanding, to have been of better-balanced temperament than has sometimes been allowed. He was irritable, even

violent, in his bitterness against accepted forms of injustice, but enlivening his passionate sincerity was a great gift of humour. His love of children speaks in his exquisite *Songs of Innocence* ; his feelings of horror at the cruelty of life in his *Songs of Experience*. He was a mystic, with a contrast of simplicity and subtlety in his work ; he felt keenly and expressed keenly social wrongs and ecclesiastical tyranny. Like Crabbe, he had to fight poverty and owed his knowledge to his own self-improving efforts.

In his youth Blake was fascinated by notions of an early mythological Britain. He was also imbued with the ideas of the mystic Swedenborg. These influences are traceable in the *Prophetic Books*, in which he evolved a complete symbolism, and in which lovely passages abound amid their strange and often obscure mysticism. We have space only to quote one of these, from " The Four Zoas " :

What is the price of Experience ? Do men buy it for a song,
Or Wisdom for a dance in the street ? No ! it is bought with the price
Of all that a man hath – his house, his wife, his children
Wisdom is sold in the desolate market where none come to buy,
And in the wither'd field where the farmer ploughs for bread in vain

Born in London, where he lived for sixty-seven of his seventy years, in his day Blake met with little encouragement, though he had his own circle of friends and a devoted wife. He was an engraver and painter as well as a poet. His admirable illustrations to his own poems transcend all ordinary vision , they are profound in their conception, superbly moving in their execution.

LESSON 20

Wordsworth and his Contemporaries


William Wordsworth


Samuel Taylor Coleridge


Robert Southey


Thomas Campbell

As one looks back on the story of the development of English poetry from the standpoint of to-day, it can be recognized that the publication in 1798 of *Lyrical Ballads*, by Wordsworth and Coleridge, was a landmark, the beginning of a new age not only in poetry, but in the whole of English literature.

William Wordsworth (1770–1850) must rank as one of the greatest of English poets. In his early days he was greatly influenced by the ideals of French republicanism and the teaching of William Godwin, the author of *Political Justice*, a work basing morals on necessity. Godwin also had a marked influence on Coleridge. When France, having first debased her humanistic ideals, forsook them for dreams of world conquest under Napoleon, the effect on Wordsworth would have been disastrous but for the devotion of his sister Dorothy and the fact that a legacy of £900 left to the brother and the sum of £100 bequeathed to the sister enabled them to settle down quietly, first at Racedown, in Dorset – where Wordsworth's one tragedy, *The Borderers*, was written—then at Alfoxden, by the Quantock hills – which district inspired his and Coleridge's contributions to the volume of *Lyrical Ballads* – and finally at Grasmere. This was the home of the Wordsworths from 1799 until the poet's death.

" The Prelude ; or, the Growth of a Poet's Mind," an autobiographical poem in blank verse, reflects the influence of ideas acquired during his visits to Germany, Italy, Switzerland, and France. That poem and " The Excursion " are parts of a scheme which was never completed.

In compiling their volume of *Lyrical Ballads*, Wordsworth and Coleridge set themselves definite tasks in accordance with their clear, if at that time revolutionary, views regarding the true nature and scope of poetry. Wordsworth was to write of everyday objects and incidents ; Coleridge was to write of things supernatural. Coleridge's chief contribution was " The Rime of the Ancient Mariner." Wordsworth included in the volume some of his poorest poems, such

as "The Idiot Boy," and some of his greatest, such as "Tintern Abbey."

Wordsworth has to be considered in three aspects—critic, teacher, and poet. His critical opinions can be studied in the preface and appendix to *Lyrical Ballads*, the preface to "The Excursion," and in numerous letters. It was Wordsworth who provided the famous definition of poetry as "emotion recollected in tranquillity" and the precept that the language of poetry should be "a selection of the real language of men in a state of vivid sensation." In the preface to *Lyrical Ballads* he writes:

> It may be safely affirmed that there neither is, nor can be, any essential difference between the language of prose and metrical composition. We are fond of tracing the resemblance between poetry and painting, and accordingly we call them sisters; but where shall we find bonds of connexion sufficiently strict to typify the affinity between metrical and prose composition? They both speak by and to the same organs; the bodies in which both of them are clothed may be said to be of the same substance, their affections are kindred and almost identical, not necessarily differing even in degree.

The best proof of the error inherent in this view of poetry is to be found in Wordsworth's own work. Elsewhere, in his intense scorn for the artificial and the meretricious, which were so characteristic of so much of the poetry of the 18th century, Wordsworth went to the verge of the trivial. But though he raised a storm of criticism, which delayed due recognition of his genius and is not yet exhausted, it is well to remember with Coleridge, one of the greatest of literary critics—especially where Wordsworth is concerned—that but for the prefaces and appendices, much of what has been said against Wordsworth's poems would be reduced to absurdity. Popularity and honours at length rewarded the poet. In 1839 Oxford gave him a Doctorate, he was given a civil list pension of £300 in 1842, and in 1843 he succeeded Southey as Poet Laureate.

As a teacher Wordsworth took his vocation seriously. "The poet," he averred, "is a teacher. I wish to be considered as a teacher or as nothing." What did he teach? George Brimley, in one of the most brilliant of his essays, written in 1851 and still applicable, contends, with reason, that the value of Wordsworth's teaching—

> lay mainly in the power that was given him of unfolding the glory and the beauty of the natural world and of bringing consciously before the minds of men the high moral function that belonged in the human economy to the imagination, and of thereby redeeming the faculties of sense from the comparatively low and servile office of ministering merely to the animal pleasures .... He has shown the possibility of combining a state of vivid enjoyment, even of intense passion, with the activity of thought and the repose of contemplation. He has, moreover, done more than any poet of his age to break down and obliterate the conventional barriers that, in our disordered social state, divide rich and poor into two hostile nations; and he has done this, not by bitter and passionate declamation on the injustices and vices of the rich, and on the wrongs and virtues of the poor, but by fixing his imagination on the elemental feelings, which are the same in all classes, and drawing out the beauty that lies in all that is truly natural in human life.

Was Wordsworth a poet? Undoubtedly. None but a great poet could have written such lines as those "Composed a few miles above Tintern Abbey," in 1798, or his "Lines suggested by a Picture of Peele Castle in a Storm." Nothing could be more satisfying than the profound thought and pellucid, memorable phraseology of his "Ode on Intimations of Immortality from Recollections of Early Childhood"; and in such simpler pieces as "The Daffodils" he wrote lines of unforgettable beauty.

But Wordsworth's claim to rank among the immortals might be based on his sonnets alone. From whatever standpoint it may be looked at, the sonnet "Composed upon Westminster Bridge, September 3rd, 1802," quoted here, is one of the very finest in the language.

> Earth has not anything to show more fair;
> Dull would he be of soul who could pass by
> A sight so touching in its majesty:
> This city now doth like a garment wear
> The beauty of the morning; silent, bare,
> Ships, towers, domes, theatres and temples lie
> Open unto the fields, and to the sky;
> All bright and glittering in the smokeless air.
> Never did sun more beautifully steep
> In his first splendour valley, rock or hill;
> Ne'er saw I, never felt, a calm so deep!
> The river glideth at his own sweet will;
> Dear God! the very houses seem asleep
> And all that mighty heart is lying still.

There is nothing in the Elizabethan sonnet-writers to surpass that in clarity of vision and perfection of form.

Samuel Taylor Coleridge (1772-1834) was a talker, a preacher, a philosopher, and a mystic. His best work belongs to his early years, when he was inspired by his love of nature and by the revolutionary idealism of France. His ballad epic of "Christabel," though a fragment, exercised in MS. form, some twenty years before it was published, a wonderful influence on Scott and other English poets.

For an explanation of the dreamland beauty of "Christabel," "Kubla Khan," and "The Rime of the Ancient Mariner," some critics consider that recourse must be had to the German philosophers, particularly to Goethe, Herder, Schelling, and others of their school, to whom Coleridge was much indebted. The first stanza of "Kubla Khan" displays his gift for poetic narrative.

> In Xanadu did Kubla Khan
>   A stately pleasure-dome decree:
> Where Alph, the sacred river, ran
> Through caverns measureless to man
>   Down to a sunless sea.

So twice five miles of fertile ground
With walls and towers were girdled round :
And here were gardens bright with sinuous rills,
Where blossomed many an incense-bearing tree,
And here were forests ancient as the hills,
Enfolding sunny spots of greenery.

With these two men began the so-called Romantic movement, which took English literature from town to countryside, from satire and moralising to description and song. Forms and incidental figures, as well as themes, were henceforward taken from the world of nature, or from the supernatural world of the imagination, rather than from cold classical legend. Elaborate poetical vocabulary was simplified into something that approximated to " the real language of men."

The third of the " Lake poets " (so-called because at one time all three lived in the Lake District) was **Robert Southey** (1774-1843), the friend first of Coleridge, then of Wordsworth. His output, both in verse and in prose, was enormous, but his poetry is far inferior to that of the other two, and he is little honoured to-day. His choice of subjects and his ponderous treatment are reasons for this neglect ; but his " The Battle of Blenheim," " The Well of St. Keyne," and " The Inchcape Rock " have a certain masculine directness, and " The Cataract of Lodore " is a *tour de force* of rhyming.

The true place of **Walter Savage Landor** (1775-1864) is with the prose writers of the 19th century (*see* Lesson 33), seeing that he wrote poetry for amusement and prose as an occupation. But it was with a poem, " Gebir," that his genius first flashed into enduring flame. He also wrote some beautiful lyrics, notably the exquisite elegy that enshrines the name of his much loved Rose Aylmer, whose early death in India he never ceased to mourn. Of his *Epigrams* the oft-quoted " On His Seventy-Fifth Birthday " is highly characteristic.

I strove with none · for none was worth my strife.
  Nature I loved, and next to Nature, Art ;
I warmed both hands before the fire of life.
  It sinks, and I am ready to depart.

Another contemporary of Wordsworth, **Thomas Campbell** (1777-1844) is, like Southey, best remembered by his lyrical poems—" Hohenlinden," " Ye Mariners of England," " The Soldier's Dream," " Lord Ullin's Daughter," and " Sons of the Evening Star " are among them. " Pleasures of Hope " is an echo of Thomson and Gray.

LESSON 21

Scott, Byron, Shelley, Keats, and Others

THE liberating revolt against classicism took various forms. It sent Wordsworth to the direct inspiration of nature ; it sent Coleridge to the supernatural and dramatic. Other poets justified the new freedom by giving free rein to imaginative fantasy.

Sir Walter Scott (1771-1832) gave particular meaning to the term " romanticism " by his excursions into the romance of the reconstructed past. He and his achievement will be more fully considered in that section of the Course dealing with the development of the novel. Yet he was a poet, too, though not perhaps of the first order ; and his long narrative pieces, " The Lay of the Last Minstrel," " The Lady of the Lake," and " Marmion," are for the million what " Christabel " and " The Ancient Mariner " are for the comparatively few.

Everything that Scott wrote was intensely masculine, robust, and virile. His was not the romanticism of moonlight dreaming or of heartbeats quickened by the song of the nightingale, and for the expression of pure joy

Lord Byron

Percy Bysshe Shelley

John Keats

Thomas Moore

in external nature and love of humanity he was not excelled by either Wordsworth or Coleridge; but his verse, though it has an irresistible dynamism of its own, is yet too mechanical to be classed with the greatest English poetry.

Probably the poet who most completely symbolised the romantic movement was Byron —George Gordon, **Lord Byron** (1788-1824). Byron's finest poetry is part of his personality, and he himself is a romantic figure. He lived and moved in an atmosphere that was for ever electrical with presage of storm, joyous intervals of sunny beauty alternating with others of sombre melancholy. In this he was intensely human. He was exceptional only in being able to give to all his moods a romantic glamour which made even his melancholy a thing of tenderness and human pity. The figure of Byron more than any other is the basis of the popular notion or caricature of the typical poet which has been current for over a hundred years, with its long hair, loose soft collar, and air of profoundly self-communing melancholy. This is possibly due to the excessive adulation with which Byron was hailed in his own day and the inevitable and equally excessive reaction to that adulation among the "Philistines."

Be that as it may, it is true to say that of all the great English poets Byron is the most subjective. He found all his emotional material within himself. In everything that he wrote it is himself that clamours for expression. The personages of his poems are all varying aspects of the poet. In fact, his poetry can be regarded as extraordinarily fascinating and brilliant autobiography.

Thus it is especially true of Byron that without some knowledge of the successive stages of his short but crowded life, his belongings, his surroundings, his friendships, and his fortunes, a great deal of his poetry lacks significance. His output was large; and it is perhaps instructive to note that his effective career as a poet began with an essay in heroic couplets, satirical—even savage—and brittle, in very much the style of Pope, whom he greatly admired; but it is equally significant that this early poem, "English Bards and Scotch Reviewers," was suppressed by him two years later, though it can now be read and enjoyed in any complete edition of Byron's work. His more solid achievement comprises two epics, or quasi-epics, "Childe Harold" and "Don Juan"—which constitute his best work—twelve narrative poems, eight dramas, seven or eight satires, and a multitude of occasional poems, lyrics, epigrams, and jeux d'esprit.

That his verse had many technical faults is true; as Sir Edmund Gosse points out, "he lacked the power to finish: he offended by a hundred careless impertinences: but his whole being was an altar on which the flame of personal genius flared like a conflagration." A stanza from a lyric poem in "Hebrew Melodies" shows him in his best vein.

> She walks in beauty, like the night
> Of cloudless climes and starry skies;
> And all that's best of dark and bright
> Meet in her aspect and her eyes;
> Thus mellowed to that tender light
> Which heaven to gaudy day denies

Byron, indeed, had the true poetic glamour; he could not be shackled by any laws of rhythm or rhyme. He was, however, shackled and mentally warped by his one personal defect—his lameness, which helped to make him cynical and jaundiced on his outlook on life.

His contemporary Trelawny, in "Recollections of Shelley and Byron," writes:

> Byron's spirit was always on the fret and fume to be doing something new and strange, he exhausted himself in speculating, plotting and planning; but when it came to the point of execution, the inertness of his body and his halting gait held him fast, so that few men even among the poets did more in imagination and less in reality than he did

The French writer André Maurois has written valuable biographical studies of both Byron and Shelley which have been translated into English and shed much light on the romantic picturesqueness of the former and on the sensitive personality of the latter poet.

Percy Bysshe Shelley (1792-1822) was, as Byron was, a herald of revolt; but he was also, what Byron could hardly be said to be, an idealist. Byron was at times sincere; Shelley always so. If Shelley erred against the social and religious conventions of his day, it was not out of contempt or in any spirit of reckless libertinism, but because he had constructed for himself a philosophy and adhered to it. Among his principal works are "Queen Mab," "Alastor," "The Revolt of Islam," "Prometheus Unbound," that dark and poignant drama *The Cenci*, "Julian and Maddalo," "The Witch of Atlas," "Epipsychidion," "Adonais," and "Hellas." In "Queen Mab" were expressed the mingled idealism and atheism of the French Revolution. "Prometheus Unbound" is well described as "the finest example we have of the working out in poetry of the idea of a regenerated universe." "Adonais," one of his loveliest poems and most finished pieces of art, was a lament for the death of John Keats. One verse is quoted in Lesson 4. A few lines from "Epipsychidion" will indicate the quality of that poem.

> There was a Being whom my spirit oft
> Met on its visioned wanderings, far aloft,
> In the clear golden prime of my youth's dawn,
> Upon the fairy isles of sunny lawn,
> Amid the enchanted mountains, and the caves
> Of divine sleep, and on the air-like waves
> Of wonder-level dream, whose tremulous floor
> Paved her light steps: on an imagined shore.

Under the grey beak of some promontory
She met me, robed in such exceeding glory,
That I beheld her not.

Shelley's was a divided personality: he lived in the world, but all his thoughts soared into the empyrean. As a poet of the imagination he was immeasurably superior to Byron. Of his lyrics, the "Ode to the West Wind" is as imperishable as anything in English poetry.

Humbert Wolfe wrote of Shelley:

Whatever brainstorms might from time to time have disturbed him, Shelley could and did reason more closely than almost any poet of them all. He held to the path of his ideal, and in all the relations of life if he was sometimes surprising as a man, it was because his Maker had painted him, in Browning's phrase, with only so much body as showed soul.

To turn from Byron and Shelley to **John Keats** (1795-1821) is like passing from a storm in which body and soul have been engaged to some sweet resting-place. Keats leaves alone the problems of passion, whether physical or purely intellectual, and tunes his lyre to hymns of beauty and the praise of nature. He is one of the first of modern literary poets, drawing his inspiration in great measure from ancient Greece and Elizabethan England. Not only Browning and Tennyson, but Dante Gabriel Rossetti, William Morris, and Swinburne owe much to Keats.

"Hyperion" is a beautiful fragment; the odes "On a Grecian Urn," and "To a Nightingale," the sonnet "On first Looking into Chapman's Homer," and the poems "The Eve of St. Agnes" and "La Belle Dame Sans Merci," stand by themselves in the foremost ranks of their kind. One stanza from the "Ode to a Nightingale," is quoted here, including some of the lines best known in the whole world of poetry.

Thou wast not born for death, immortal Bird!
No hungry generations tread thee down;
The voice I hear this passing night was heard
In ancient days by emperor and clown:
Perhaps the self-same song that found a path
Through the sad heart of Ruth, when, sick for home,
She stood in tears amid the alien corn;
The same that oft-times hath
Charmed magic casements, opening on the foam
Of perilous seas, in faery lands forlorn.

They are the work, be it always remembered, of one whose father worked in a livery stable, and who began life as a surgeon's apprentice and was dead at the age of twenty-six.

Thomas Moore (1771-1852) had in abundance the double gift of vocal and poetic melody. An Irishman, he achieved the more enduring part of his reputation by his *Irish Melodies*, lyrics of haunting beauty, written to be sung to native airs instinct with an equally tender spirit. They include such gems as "Go where glory waits thee," "The last Rose of Summer," "Believe me, if all those endearing young charms," "The Minstrel Boy," and "The harp that once through Tara's halls." Moore also owed a certain social success in part to a gift for witty political satire, exemplified in "The Twopenny Post Bag" and "The Fudge Family in Paris."

While at the zenith of his fame, he forsook lyrical for narrative poetry, and in 1817 published "Lalla Rookh," a poem which has some obvious faults, the chief one being an excess of Oriental sensuousness, yet also has many passages of rare beauty and some of splendour. It retained its great popularity for many decades, but is too little read to-day.

Moore rendered a real service to English verse by introducing a great variety into the use of the lyric metres. Poetry was still at that time fettered by a rigid insistence upon the iambic and trochaic metres. Possibly for the satisfaction of his own musical instinct, he made free use of dactylic and anapaestic measures, managing them with extraordinary dexterity, and contributing greatly to the emancipation of all lyric poets who have followed him.

Lesser poets of this period whose work will be found rewarding in various ways to the student, as to the general reader, include the following:

Leigh Hunt (1784-1859), whose reputation, due in the main to his prose writings, would not be inconsiderable were it based only on "The Story of Rimini" and his other and shorter poems, of which "Abou Ben Adhem" and "Jenny Kissed Me" are most familiar.

Thomas Hood (1799-1845), whose verses "I remember," "The Dream of Eugene Aram," "The Song of the Shirt," and "The Bridge of Sighs" are as truly poetry of the heart as his humorous Ballads (such as "Faithless Nelly Gray") are inimitable in their brilliant punning and their cheerful Cockney irreverence. Hood is another poet who has added to the language a good stock of quotable lines.

Thomas Babington Macaulay, **Lord Macaulay** (1800-59), whose spirited *Lays of Ancient Rome* possesses something of both the quality and the defects of Scott's verses, but long remained the popular ideal of the heroic. The most widely known is "The Lay of Horatius."

Thomas Love Peacock (1785-1866), who inserted into his novels a number of delightful lyrics.

Ebenezer Elliott (1781-1849), the popularity of whose politically inspired *Corn Law Rhymes* has served mainly to distract attention from his transcripts from nature.

LESSON 22

Greatest Poets of the Victorian Age


Lord Tennyson


Robert Browning


Elizabeth Browning


Matthew Arnold

IN the crowded galaxy of Victorian poets, Alfred, **Lord Tennyson** (1809-92), is the " bright particular star." One of the most scholarly and exact of poets since Milton and Gray, he was also, with the possible exceptions of Burns and Byron, the most popular since Shakespeare.

Not even Wordsworth took his vocation more seriously. From a period of idealism he passed to one of something very like pessimism. Always hating the petty conventions of the present, he became in his later years too much of a social critic for his poetry to benefit. From first to last, however, he was a master of word-music, capable of rendering his impressions with almost miraculous fidelity, yet always in harmonious measures that paid regard not only to the normal requirements of rhyme and rhythm but also to the musical integrity of vowel and consonant. Could there be more expressive lines yet withal more musical than, say, these ?

> The moan of doves in immemorial elms
> And murmuring of innumerable bees.

Although, after half a century of extreme popularity among his contemporaries, Tennyson suffered from the inevitable reaction, his value to the student is twofold. On the one hand, he teaches by example the qualities and possibilities of the English language ; on the other hand, his poems may not inaptly be described as " the voice of the century " in all its modulations between the extremes of buoyant hope and despair. " Locksley Hall " and its sequel, " Locksley Hall Sixty Years After," sum up the difference between liberal aspiration and democratic achievement. In " Maud " he entered an eloquent protest against materialist views of life.

From a technical standpoint " Maud " is regarded by competent critics as one of the best and most finished of Tennyson's poems ; it is the one, moreover, of which the poet himself was specially fond. It contains the exquisite lyric " Come into the garden, Maud."

Ahead of his time, Tennyson advocated the higher education of women in " The Princess " (1847), which, like " Maud " (1855), has many exquisite lyrics embedded within it. His greatest achievements were, perhaps, " In Memoriam " (1850), enshrining his grief and musings over the death of his friend Arthur Hallam, and " Idylls of the King " (1859-72), a noble epic in twelve episodes, based on the Arthurian romance.

The Tennyson that penetrates the heart of the many is comprised in the lyrics, such as the song from " Maud " already referred to, together with " Break, Break, Break," " Sweet and Low," " The Splendour Falls," " Tears, Idle Tears," and his swan-song, " Crossing the Bar." But the " Idylls of the King " are also widely loved. " The Lady of Shalott," " Mariana in the South," " The Miller's Daughter," " Oenone," " The Palace of Art," " The May Queen," " The Lotos-Eaters," " A Dream of Fair Women," " The Morte d'Arthur," " Love and Duty," and " Locksley Hall " have all been rightly placed among the poems which have profoundly affected English literature.

Like Shakespeare and Pope before him, Tennyson possessed the gift of being able to express the thoughts and feelings of all humanity in phrases so memorable that they have become enshrined in the language and in the consciousness of all English people ; so much so that one feels that such thoughts can now never be better expressed in any other way—one wonders, indeed, if the thoughts could ever have existed before the poet found the words which gave them the exact utterance for all time. That is why Tennyson's musical phrases are so commonly quoted—such phrases as these which follow ; and if they have become so

familiar as to sound hackneyed, remember that this is only evidence that the phrases were needed, and that Tennyson coined them as a representative human being giving voice to the need, like a true poet.

We needs must love the highest when we see it

More things are wrought by prayer
Than this world dreams of.

In the spring a young man's fancy lightly turns to
thoughts of love.

Kind hearts are more than coronets,
And simple faith than Norman blood.

But O for the touch of a vanished hand,
And the sound of a voice that is still.

Wearing the white flower of a blameless life

Thro' craven fears of being great.

In that fierce light which beats upon a throne

The old order changeth, yielding place to new,
And God fulfils himself in many ways,
Lest one good custom should corrupt the world.

That men may rise on stepping-stones
Of their dead selves to higher things

Nature, red in tooth and claw

'Tis better to have loved and lost
Than never to have loved at all

Not once or twice in our rough island-story,
The path of duty was the way to glory

There lives more faith in honest doubt,
Believe me, than in half the creeds

In the Parliament of man, the Federation of the world

My strength is as the strength of ten,
Because my heart is pure

Where Freedom slowly broadens down
From precedent to precedent

Our little systems have their day,
They have their day and cease to be.

With **Robert Browning** (1812 89), "form" was a secondary consideration. Its requirements, in fact, constituted for him almost an obstacle to the flow of thought. He is as difficult and obscure as, for the most part, Tennyson is clear and easy to the common understanding. With Browning, far more than with Tennyson, it is necessary to consider the life and the poetry as inter-dependent and inter-explanatory. It has been well said that "much of the apparent obscurity of Browning is due to his habit of climbing up a precipice of thought, and then kicking away the ladder by which he climbed."

There is no gloom in Browning. He is all virility. His dramas and his poems are the appurtenances of an intellectual gymnasium. With Browning, "Life is-- to wake, not sleep," "Rise and not rest," he cries; but "press——

From earth's level, where blindly creep
Things, perfected, more or less,
To the heaven's height, far and steep,
Where, amid what strifes and storms
May wait the adventurous guest,
Power is love.

Few poets have given rise to such a body of criticism and interpretation as Browning. But it is not always what is best worth knowing that is clearest of comprehension, and although many people would rather spend an evening with Tennyson for the certain solace of his word-music, the same time spent in mental sparring with Browning might be more stimulating in effect.

As an example of Browning's enigmatic style, consider the following style. It is taken from his "Sordello."

Study mere shelter, now, for him, and him,
Nay, even the worst, just house them! Any cave
Suffices: throw out earth! A loophole? Brave!
They ask to feel the sunshine, see the grass
Grow, hear the larks sing?" Dead art thou, alas,
And I am dead! But here's our son excels
At hurdle-weaving any Scythian, fells
Oak and devises rafters, dreams and shapes
His dream into a door-post, just escapes
The mystery of hinges. Lie we both
Perdue another age. The goodly growth
Of brick and stone! Our building-felt was rough,
But that descendant's garb suits well enough
A portico-contriver.

* * *

The work marched! step by step, a workman fit
Took each, nor too fit—to one task, one time -
No leaping o'er the petty to the prime,
When just the substituting osier lithe
For brittle bulrush, sound wood for soft withe,
To further loam-and-roughcast-work a stage -
Exacts an architect, exacts an age

At a first reading of these abrupt, craggy phrases, and even after a second reading, it is not immediately clear they present a kind of brief survey of the gradual evolution of architecture from its primitive beginnings, or that it is reiterating the literal truth that Rome was not built in a day. Yet once that clue to the meaning of the passage has emerged, one can appreciate the close-packed economy of the words, no less than their choice and arrangement. Almost every sentence is a stimulating intellectual challenge. So, also, is the whole argument; and equally challenging, because equally enigmatic, is its relation to the theme of the poem as a whole or even to its immediate context.

Professor Dowden, Browning's most competent critic, says:

Browning as a poet had his origins in the romantic school of British poetry; but he came at a time when the romance of external action and adventure had exhausted itself, and when it became necessary to carry romance into the inner world, where the adventures are those of the soul. On the ethical and religious side he sprang from English Puritanism. Each of these influences was modified by his own genius and by the circumstances of its development. His keen observation of facts and passionate inquisition of human character drew him in the direction of what is termed realism . . . His Puritanism received important modifications from his wide-ranging artistic instincts and sympathies, and again from the liberality of a wide-ranging intellect . . . He regarded our life on earth as a state of probation and of preparation . . . In his methods Browning would acknowledge no master; he would please himself and compel his readers to

accept his method, even if strange or singular . . . His optimism was part of the vigorous sanity of his moral nature . . . The emotions which he chiefly cared to interpret were those connected with religion, with art, and with the relations of the sexes

It is especially important to remember that Browning's thought where it is most significant is more or less enigmatical if taken by itself; "its energetic gestures, unless we see what they are directed against, seem aimless beating in the air." That portion of his work, therefore, which is primarily polemical bids fair to fail in interesting posterity. His masterpiece is the living human epic of "The Ring and the Book." He wrote many long poems, of which "Sordello" and "Fifine at the Fair," though difficult, are among the most remarkable, together with "Christmas Eve and Easter Day," "Paracelsus," "Bishop Blougram's Apology" and "Andrea del Sarto." Among his most popular are "How They Brought the Good News," "Saul," "The Lost Leader," "Home Thoughts from Abroad," "The Grammarian's Funeral," "Rabbi Ben Ezra," "The Last Ride Together," "Love Among the Ruins," the charming songs from "Pippa Passes," and (of course) "The Pied Piper of Hamelin."

A more vitally dramatic poet than Browning never existed; yet his remarkable series of poetic dramas *Strafford*, *A Blot in the 'Scutcheon*, *Colombe's Birthday*, and others—lack the lucidity essential to the theatre, being too nimble in action and too clever for the audience to follow. He began to write dramatic lyrics about 1841, and some of them are included in the series *Men and Women*, published in 1855. They embody his most original, poignant, tragic, grotesque, and lively genius of expression.

Elizabeth Barrett Browning (1806–61), wife of Robert Browning, was gifted with fervour, imagination, and sympathy. Her first volume of poems, published in 1844, included the often-quoted "Cry of the Children"; but her most notable contribution to literature was her so-called "Sonnets from the Portuguese," inspired by her love for **Robert Browning** and his courtship of her. This was followed by "Casa Guidi Windows," written in the Browning home in Venice, and a metrical romance, "Aurora Leigh." Her work is marked here and there by slipshod rhythms, also by a diffuseness that was a fault of the fashion of her period rather than innate.

Each of the three Brontë sisters, Charlotte, Agnes, and Emily, published a book of poems in 1846. As might be expected, **Emily Brontë** (1818–1848) revealed the greatest genius. Her poems have a sense of vision and are inspired by a feeling that is profoundly passionate in its perplexed questioning of life and its meaning and promise. Her work as a poet has gained only slowly the general appreciation it deserves, though both Matthew Arnold and Swinburne fully recognized her genius.

The poems of **Matthew Arnold** (1822–88), austere in form, classic in spirit, breathe the indefinable sadness of culture threatened by anarchy. Arnold would have won lasting distinction among the few had he written only "The Strayed Reveller" (a perfect anticipation of the *vers libre* style), "Empedocles on Etna," "The Scholar Gypsy," "Sohrab and Rustum," and his Arthurian poem "Tristram and Iseult." Four stanzas from his "Self-Dependence" embody both his restraint and his power of word-painting.

> "Ah, once more," I cried, "ye stars, ye waters,
> On my heart your mighty charm renew;
> Still, still let me be, as I gaze upon you,
> Feel my soul becoming vast like you."
>
> From the intense, clear, star-sown vault of heaven,
> Over the lit sea's unquiet way,
> In the rustling night-air came the answer:
> "Wouldst thou *be* as these are? *Live* as they.
>
> "Unaffrighted by the silence round them,
> Undistracted by the sights they see,
> These demand not that the things without them
> Yield them love, amusement, sympathy.
>
> "And with joy the stars perform their shining,
> And the sea its long moon-silver'd roll;
> For self-poised they live, nor pine with noting
> All the fever of some differing soul."

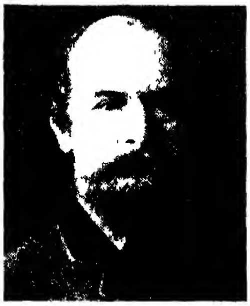
LESSON 23

"Pre-Raphaelites" and other Later Victorian Poets

Much of the later poetry of the 19th century was influenced by the art movement that has sometimes been called "Pre-Raphaelitism." The movement has in fact little connexion with the original self-styled and short-lived Pre-Raphaelite Brotherhood, which had made so marked an impact on the world of painting at the end of the 1840s, except that Rossetti as a very young man had become a member of that small Brotherhood, though not its most typical member; and it was Rossetti in the later fulfilment of his highly individual genius, both as painter and as poet, who was the chief inspiration of the later movement. Apart from Rossetti, the true equivalents in painting to the later poets were not Holman Hunt and Millais, the other painting members of the original Brotherhood, but such men as Burne-


Dante Gabriel Rossetti


Christina Rossetti


A. C. Swinburne


William Morris

Burne-Jones and Albert Moore, with William Morris, as both poet and designer-craftsman standing, like Rossetti himself, with a foot in each of two allied camps.

This movement sought its romantic ideal in a blend of serene clarity and refined, sensuous luxury, which removed poetry and painting to some harmonious sphere aloof from the workaday world, a sphere in which beauty of form and beauty of phrase threatened to become almost oppressive except in the most inspired hands. The decadence of this ideal was seen in the effete and overripe romanticism of that "aesthetic" cult—the cult of art for art's sake—which flourished from the 1880s into the 1890s, and was satirised by W. S. Gilbert in the comic opera *Patience*, with its tale of two rival poets.

Tennyson himself, and even the more austere Matthew Arnold, though never within the movement, were not aloof from its finer manifestations: indeed Tennyson's preference for jewel-like words and his propagation of the glamorous Arthurian legend may well have helped to inspire the movement.

Of **Dante Gabriel Rossetti** (1828–82), A. C. Benson wrote:

> He has stimulated the sense of beauty, the desire to extract the very essence of delight from emotion, form and colour; he has inculcated devotion to art.

Many of his poems were written as commentaries on his own pictures; and conspicuous among his writing are translations from Italian, French, and German poets. His sister, **Christina Rossetti** (1830–94), was, both in all her writing and in her attitude to life, essentially a poet. She was a devotional writer of the finest quality, with a lyric gift that was rare and distinguished. Her work possesses qualities that must always appeal particularly to the sorrowful and afflicted; but it will also engage the interest of the student as conveying the "Pre-Raphaelite" ideal in its purest form.

William Morris (1834–96), possessor of a the comfortable private income, devoted his life to designing and making of beautiful things—furniture, wallpapers, tapestries, cups and saucers, stained-glass windows, and finally, towards the end of his life, the treasured printed books of his Kelmscott Press—all informed by a mock-medievalism that was the besetting weakness of the whole movement. The same spirit is found in his poetry, most of which has a medieval cast of thought. It indulges strenuously in romantic daydreaming. His major works in verse are *The Earthly Paradise*, published 1868–70, and founded on Greek, Norse and other legends; and an epic, *The Life and Death of Jason* (1867). He also wrote several somewhat laboriously beautiful prose romances.

The predominating name associated with this particular branch of the romantic revival is that of **Algernon Charles Swinburne** (1837–1909). There could not be a more extreme antithesis to Browning than Swinburne. Browning was a thinker, striving to utter his thoughts in poetic form, and never a stringer-together of mellifluous words for the sake of their metrical charm. With Swinburne, form was paramount, and the intellectual content of the verse seemed secondary. Tennyson described him as "a reed, through which all things blow into music"; and his verse is as near to actual music as that of any poet who ever lived. The following stanza forms part of a chorus from his "Atalanta in Calydon."

> Before the beginning of years
>   There came to the making of man
> Time, with a gift of tears;
>   Grief, with a glass that ran;
> Pleasure, with pain for leaven;
>   Summer, with flowers that fell;
> Remembrance fallen from heaven,
>   And madness risen from hell;
> Strength without hands to smite;
>   Love that endures for a breath;
> Night, the shadow of light,
>   And life, the shadow of death.

No English poet more definitely felt himself to be a poet than Swinburne did. From his earliest years he consecrated himself to the tuneful muses. Even when his verse is

disfigured by excess of passionate phrase, it produces a sense of exaltation.

Although he was the finest English lyrist after Tennyson, and an artist even more comprehensive than Tennyson in the mastery of various metres, it would be wrong to leave the impression that Swinburne's concern was so fixed upon the form of his poetry that he was careless of its content, or that he was obsessed by the sensuous side of life. True, one critic has said of him :

> He wrote, as Tannhäuser might have sung with the madness of Venusberg upon him, of strange sins, and exotic passions and mad eroticism . . . Swinburne represents genius without talent, passion without reason. The cooler facts upon which he touched were all emotions felt wildly, rather than things understood clearly.

Yet his poetry abounds in passages in which high thought and true emotions are uttered in lines of intense and enduring beauty—evidence that his soul was at such times in tune with life's inmost and profoundest harmonies. His *Tristram of Lyonesse* should be compared with Tennyson's. He wrote a magnificent trilogy on Mary Stuart, and his *Atalanta* and *Erechtheus* are superb poetic dramas.

Coventry Patmore (1832–96) can be classed with the "Pre-Raphaelites" by reason of his collection of odes, *The Unknown Eros*, but he was possibly the least "romantic" among them. He is a writer at once original, egotistic, and mystical.

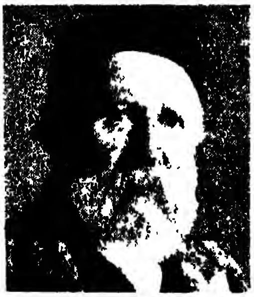
As for **George Meredith** (1829–1909), whose poetry was greatly influenced by the movement, critical opinion is still divided, but it may be that he is destined to live as a poet when his long novels (dealt with in the section of this Course concerned with the novel) are little read. His verse has a forthright vigour of expression that is certainly not characteristic of his prose. "Love in the Valley," from his *Poems and Lyrics of the Joy of Earth*, is a characteristic example of the romantic note in his work. Here is the first stanza :

> Under yonder beech-tree single on the greensward,
> Couched with her arms behind her golden head,
> Knees and tresses folded to slip and ripple idly,
> Lies my young love sleeping in the shade.
> Had I the heart to slide an arm beneath her,
> Press her parting lips as her waist I gather slow,
> Waking in amazement she could not but embrace me :
> Then would she hold me and never let me go ?

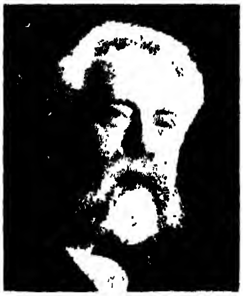
It is a commonplace of journalism to talk of the decadence of the 1890s. Undoubtedly much of the poetry of that period reveals a moral and spiritual disorder, due to the enervating external influences of the time. The term *fin de siècle* (end of the century) was coined to describe, and possibly to explain, a mood of complacent, drifting cynical fruitlessness which to some extent affected almost all the arts—as though the artists had become all too aware of the massive towering achievements which had just preceded them and of their own relative ineffectualness, and were taking refuge in comfortable and sometimes obscure valleys. This defect can be recognized in the work of **Ernest Dowson** (1867–1900), **Richard Le Gallienne** (1866–1947), **Lionel Johnson** (1867–1902), **Arthur Symons** (1865–1945), **Oscar Wilde** (1856–1900), **Lord Alfred Douglas** (1870–1945), and even in the dainty work of **Austin Dobson** (1850–1922) and the charming preciosity of **Alice Meynell** (1850–1922), foremost woman poet of her time. Nevertheless all these produced poetry of high merit when it was not marred by lushness, artificiality, and self-conscious egotism. Lord Alfred Douglas, especially, wrote some exceptionally beautiful sonnets ; while Oscar Wilde's "Ballad of Reading Gaol" has in its stark narrative something of the haunting, brooding power of Coleridge's "Ancient Mariner."

For the rest, each earnest searcher will no doubt discover in his own way whatever may be of value to him in the output of the later Victorian poets. All that need be done here is to indicate some of those who are most likely to reward a reader's sympathetic attention.

T. E. Brown (1830–87) was a Manx-born poet and a distinguished scholar who produced


Gerald Massey


Francis Thompson


W. E. Henley


Wilfrid Scawen Blunt

moving lyrics embodying his love of nature.

Sir Edwin Arnold (1832 1904) interpreted Buddhism for western readers in "The Light of Asia."

Gerald Massey (1828–1907) wrote some tenderly emotional lyric poetry, notably the exquisite "Ballad of Babe Crystabel."

James Thomson (1834-82), who wrote under the initials "B. V.," depicted the darker side of London in "The City of Dreadful Night," and ranks among the unfortunates of genius.

Francis Thompson (1859–1907) was a powerful visionary who wrote "The Hound of Heaven" and was one whose intuition reached the "smouldering core of mystery."

John Davidson (1857 1909) was a rebel against the narrow prejudices and oppressions of contemporary life, among whose poems are the "Fleet Street Eclogues"

Robert Louis Stevenson (1850-94), whose lyrical poetry is limited in quantity, is considered by some judges to be in his verse more truly expressive of his precious and gentle nature than in much of his studiously stylised prose writing.

W. E. Henley (1849 1903) possessed an innate fineness which rings through all the vigour of his poems. His "Invicta," beginning with the line "Out of the night that covers me" loses nothing of its force and fineness of phrase by being over-quoted.

George MacDonald (1824 1905) wrote many short lyrics and "The Diary of an Old Soul," declared by Ruskin to be one of the three great religious poems of the century.

Wilfrid Scawen Blunt (1840-1922) stands out from the decadent 1890s as a genuine poet, noted especially for his sonnet sequences and his versions of the "Seven Golden Odes of Pagan Arabia."

Sir William Watson (1858-1935), as liberal in spirit as in his politics, began and continued as a disciple of Wordsworth, and has some of the defects as well as many of the merits of the greater writer, especially in his mastery of the sonnet form and in the grave beauty and serene simplicity of his odes.

The serious student should also take special note of the work of **Gerard Manley Hopkins** (1844 89). His poems were never written with a view to publication. Most of them were included in letters to Robert Bridges, and it was Bridges who printed a first collection in 1918, an enlarged edition appearing in 1930 after the death of Bridges. The whole of Hopkins's known output occupies no more than 100 pages, for he renounced poetry as a worldly vanity when he became a Jesuit. But what he left is important by reason of his metrical experiments and his constant striving to concentrate within an economic use of words as full a poetic significance as they could carry. To achieve his ends he would often invent new words, sometimes most effectively, sometimes not. Often his choice of a word would be influenced, if not governed, by some precedent use, not immediately recognizable except to the few, which had imbued it with a subtle secondary, or even tertiary, connotation. His influence on contemporary 20th-century poetry, from T. S. Eliot onwards, has been very considerable. A characteristic example of his style, with all its virtues and its great defect of obscurity, is "The Wreck of the Deutschland."

LESSON 24

Twentieth-century Poetry—I

One of the most eloquent latter-day poets, W. B. Yeats, declared in 1936: "England has had more good poets from 1900 to the present day than during any period of the same length since the early 17th century." It was a bold claim, and it may be that it rests upon an illusion, for the passing time constantly serves to winnow grain from chaff, and doubtless every age has seen the emergence of poets held in considerable esteem by their contemporaries only to become neglected or forgotten by succeeding generations.

The names of poets of the past half-century, and "good" ones too, certainly crowd upon our consciousness, but are they really any more numerous than those of the 1850s who were recognized as good by their contemporaries? Many of the present writers, be sure, will satisfy us because they are in tune with the present idiom in verse, the prevailing fashion in thought. They satisfy us, they titillate our sensibilities, because they, like ourselves, are of the age. But how many are for all time? When time begins to deliver its firmer judgments, how many will endure as the great poets before them have endured? Nobody can tell; and it is wisest to reserve judgment. But that wisdom need not debar anyone from the fullest enjoyment of what seems good now.

All the foregoing is a rather obvious explanation of why, in the completion of the section of this Course which deals with poetry, no attempt will be made to assign any definite "place" in English literature to any of the poets mentioned. The time for final valuation lies in the future.

Nevertheless certain broad tendencies in the poetry of the present century should be noted by all students; and the reasons are sufficiently

obvious why any 20th-century poetry, good or less good, will make a more immediately effective impact on a 20th-century mind than does the poetry of any earlier period, and why therefore it should be studied and savoured and liked or disliked, according to individual taste. Perhaps from the poetry of our own day, because it tends to speak our own thoughts about our own immediate and familiar world in our own idiom, we can understand more easily than from any other the essential significance of all poetry ; and what is more important, learn to enjoy all poetry.

Chronologically, the first poets whose work is to be considered are those who were already to the forefront at the turn of the century or during its earlier years. They include Robert Bridges, Thomas Hardy, Rudyard Kipling, John Masefield, Wilfrid Wilson Gibson, Hilaire Belloc, G. K. Chesterton, and A. E. Housman.

Robert Bridges (1844–1930), a master of metre and a most scholarly poet, was made Poet Laureate in 1913. Some of his finest work is to be found in his sonnet sequence, "Eros and Psyche," and in "The Growth of Love" ; and nearly all his short lyrics reward study. When he was over 80 years old he published his most ambitious work "The Testament of Beauty," an astonishingly sustained achievement in loose hexameters. To this long philosophical poem much varied criticism has been devoted. It is noble in intention, and contains passages of high wisdom, superbly expressed.

Here is an example of his lyrical gift, the first two stanzas of a short poem of which W. B. Yeats said : "Every metaphor, every thought a commonplace, emptiness everywhere, the whole magnificent" :

I heard a linnet courting
His lady in the spring ;
His mates were idly sporting,
Nor stayed to hear him sing
His song of love.
I fear my speech distorting
His tender love.

The phrases of his pleading
Were full of young delight ;
And she that gave him heeding
Interpreted aright
His gay, sweet notes,
So sadly marred in the reading,
His tender notes.

Thomas Hardy (1840–1928) had written verse throughout his life, but it was not until his later years, when he had finished with the writing of novels, that he began to be seriously considered as a poet of tragic genius, whose poetic achievement stands even higher, in the opinion of many, than his achievement as a novelist. In either form, what he had to say was consistent. His poems, like his novels, give expression to his profound and tender pity for humanity, collectively and individually, and indeed for all living things, as creatures of circumstance, caught in the mesh of a creation eternally malignant by reason of its very indifference to the aspirations and endurances of its creatures.

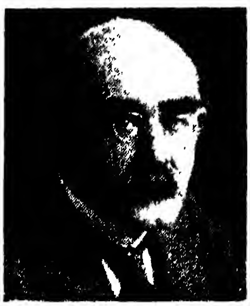
Hardy does not question the meaning of the universe, like Browning. He has made up his mind about it, finds it grim, and presents it with an echo of what he perceives as its essential irony. The titles of two collections of his shorter poems afford a clue to his philosophical standpoint : *Time's Laughing Stocks* and *Satires of Circumstance*. Inherent in his simplest and most commonplace themes can be detected a constant awareness of their relationship to the fact of eternity.

His most remarkable achievement, the culminating statement of his point of view, is his full-scale "epic-drama," *The Dynasts*. This is a vast and detailed chronicle of the Napoleonic wars from 1805 to 1815, couched in dramatic form. It consists of 19 acts, or 130 scenes, and has hundreds of characters. But what gives it its unique character is that the entire action—ranging wide over time and space, and from the clash of mighty empires and armies in the field to the clash of opinions in a London club, sometimes seen in the sharp detailed focus, sometimes in one broad majestic sweep—is played out before an audience of immortal


Robert Bridges


Thomas Hardy


A. E. Housman


Rudyard Kipling

powers, aloof and impassive, who provide both commentary and chorus ; and they themselves are subject to an ultimate power, which Hardy names the Immanent Will and of which he allows us one glimpse—a mysterious entity, grey, blind, shapeless, devoid of feeling, unamenable to entreaty. It is a tremendous conception, magnificently sustained.

Hardy's shorter lyric verse is of high quality. He practises a great economy of words, his phrasing is direct and vigorous, and he is never afraid of employing an unusual metrical form or an "unpoetic" phrase if it serves his turn.

Alfred Edward Housman (1859–1936) was a poet not dissimilar to Hardy in the bleakness of his message. He was a professor of Latin, first in London University, then at Cambridge, whose repute as a poet is founded on just three small volumes of lyrics, one of which was published only after his death. The first, "A Shropshire Lad," appeared in 1896. The lyrics, simple, musical, and highly finished in style, express a bitter fatalism, and sometimes a morbid preoccupation with violent death, which leads him sometimes into bathos. This four-line epitaph is characteristic both in matter and in manner :

Here dead we lie because we did not choose
 To live and shame the land from which we sprung.
Life, to be sure, is nothing much to lose ;
 But young men think it is, and we were young.

A writer who exerted an influence of an altogether different kind was **Rudyard Kipling** (1865–1936). His repute and his popularity as a writer of both prose and poetry of originality and force were established well before the turn of the century. He broke inescapably into a poetic era that was dominated by Oscar Wilde and the other "decadents," though no man was ever so much the antithesis of all that is implied by the term "decadence." Whether or not Kipling's verse ranks as highly as his prose (which is separately considered in a later Lesson) is at least debatable. Of much of it the critical could say that when it is not coarse-grained it is somewhat pretentious. Truly his muse moved to music, but the music was so often either the superficial tinkle of the banjo or the bang and squeak of the martial drum and fife. Moreover, there are certain tricks of technique, such as his tendency to use the word "ye" instead of "you" for the purpose of pointing his more solemn utterances, and his partiality for sweeping generalisations about life and mankind in phrases that sometimes suggest the oracular wisdom of the East, and sometimes a rather too knowing clubman.

Kipling, who began to write when he was a journalist in India, made the Englishman at home infinitely more aware than he had ever been before of those of his kindred who were serving and toiling in distant outposts of Empire, whether as soldiers (as in *Barrack-Room Ballads*) or as civilians (as in *Departmental Ditties*). He sang of men at their work on land and sea. The theme was one that invited glowing, picturesque, forceful phrases, and these Kipling had always at command, liberally and often brilliantly reinforced with such a use of slang and occupational and local jargon of all kinds as had not previously been associated in men's minds with the making of poetry.

This was the earlier Kipling, vigorous, masculine, and tremendously effective, catching the appreciative ear of a vast public. In later life, after tragic personal experiences, he mellowed greatly. Settling in a sequestered part of Sussex, he discovered the soul of England in the soil of England and expressed his appreciation of both in verse as glowing as ever but more deeply felt and therefore more permanently satisfying to the reader. As he grew older, he wrote less and less and employed forms and symbols that became increasingly obscure ; but the music was ever more restrained, acquiring, indeed, a great measure of dignity far removed from the lilting of his earlier days.

The contemporary student will probably derive most pleasure from the collections entitled *Songs from Books* and *The Years Between* ; but the early *Barrack Room Ballads* and *The Seven Seas* should also be studied for a full appreciation of Kipling's forceful impact on the story of English poetry.

Thanks to Kipling, people had begun to realize once more that forcefulness, even violence, of language was not necessarily incompatible with poetry. So that in 1902, when **John Masefield** (b. 1875) published his *Salt-water Ballads*, which endeavoured to do for the ordinary sailor what Kipling had done mostly for the ordinary soldier, his bold rhythms did not offend as much as they might otherwise have done. Masefield had sailed before the mast in early days, and the note was authentic. It was heard again insistently in *Ballads and Poems*, published in 1910. But in the following year Masefield took the process a step farther, in the first of his long narrative poems, "The Everlasting Mercy." This described, in rough-and-ready rhyming and with a lurid brutality of diction and circumstance, the conversion of a drunken village fighter and ne'er-do-well. Surprisingly, it contains passages of serene lyrical beauty. Other narrative poems, not dissimilar in scope, followed : "Daffodil Fields," "The Widow in the Bye Street," and "Dauber," the story of a ship's painter—all unforgettable in their setting of tragic violence, and in their fulfilment of Masefield's

own purpose as declared in his poem "A Consecration."

Others may sing of the wine and the wealth and the mirth . . .
Mine be the dirt and the dross, the dust and the scum of the earth !

Masefield's great narrative skill, which has been compared—not unreasonably—with that of Chaucer, was later used to less disturbing but no less stimulating effect in "Reynard the Fox" and "Right Royal," each poem depicting a phase of English sport, the first a fox-hunt, the second a steeplechase. Nevertheless his achievement as a writer of sonnets and lyrics should never be understressed. "Sea Fever," "Tewkesbury Road," "Cargoes," "London Town," "Beauty," and "The Chief Centurion" seem certain to endure

Wilfrid Wilson Gibson (b 1878) was another who wrote of the lives of ordinary people, but with more restraint than Masefield. His effects are gained by simplicity and sincerity. In "The Stonefolds" (blank verse), "Daily Bread" (irregular unrhymed verse), "Fires" (rhymed dramatic monologues), and "Krindlesyke" (in dramatic form), he writes of the sorrows and joys of everyday folk His best-known lyric is "Lament," which begins :

We who are left, how shall we look again
Happily on the sun or feel the rain . . ?

It would be difficult to pick two men more unlike in temperament and outlook than Kipling and **Gilbert Keith Chesterton** (1874 1936). Yet Chesterton's poetry owed something to the influence of the older man, and each possessed not only a journalistic gusto for the topical occasion, but an instinct for the picturesque or dramatic word. Like Kipling, Chesterton knew how to introduce the significant colloquialism and often indulged in a free and easy ballad lilt. Much of Chesterton's verse is comic and satirical ; all of it is robust and resounding, touching the heights in "Lepanto" and "The Ballad of the White Horse." **Hilaire Belloc** (1870 1954), friend and kindred spirit of Chesterton, was of French birth, but greatly attached to the land of his adoption. He never tired of singing the glories of the English (especially the Sussex) countryside and of English (especially Sussex) beer. He, too, wrote much comic and satirical verse, and both Chesterton and Belloc loved the sheer exercise of their ingenuity in a variety of verse forms ; again, both men were fervent Roman Catholics, untroubled by any speculations about the purpose of the universe, free to proclaim a joyous acceptance of all that it can offer. Yet in his serious lyrics Belloc reveals himself as possessor of the more acute and delicate perception of beauty.

The early years of the 20th century also saw the emergence of a new Irish school of poets, of whom the leader was **William Butler Yeats** (1865 1939). Yeats had already won recognition as a fine poet in the 1890s ; and, indeed, his remarkable powers of development, and his lifelong eagerness to explore new worlds and new theories, made him a leading influence upon three generations of contemporaries The lyrical and emotional qualities of his shorter poems, and the mystical tendency always latent in him, entitle him to rank as the great poet of the "Celtic Twilight." He created a body of poetry and drama which reflected both the old Irish literature and the contemporary life of Ireland. His earlier poetry, e.g. that contained in the volume entitled *Wind Among the Reeds*, tended to be over-elaborated with imagery. In his later works this tendency was completely reversed in the search for austerity of style even at the risk of obscurity in meaning. But, as one critic has written, he "never lost his command of the phrase that falls like a hammer or quietly steals the breath."

The volume called *Responsibilities*, published in 1914, is the collection of verse which best represents his period of transition from one style to the other ; and he can be further profitably studied in *The Wild Swans at Coole* (1919), *The Tower* (1927), and *The Winding Stair* (1929).

The final stanza from his poem "Coole and

John Masefield

Wilfrid Wilson Gibson

William Butler Yeats

Walter De La Mare

Ballylee," written in 1931, beautifully summarises his own view of his own achievement:

We were the last romantics - chose for theme
Traditional sanctity and loveliness;
Whatever's written in what poets name
The book of the people; whatever most can bless
The mind of man or elevate a rhyme;
But all is changed, that high horse riderless,
Though mounted in that saddle Homer rode
Where the swan drifts upon a darkening flood.

Others who drew upon the folk tradition of Ireland for the themes of their lyrics include **G. W. Russell** (1867-1935), better known as "A.E.," **J. M. Synge** (1871-1909), **Padraic Colum** (b. 1881), **Herbert Trench** (1865-1923), and **James Stephens** (1882-1950) (though the two last named accepted a somewhat wider range of inspiration). The collected poems of "A E.," whose genius is clothed with ancient legendary lore and symbolism, reveal in almost everyday language rare beauty of vision and quiet rapture.

No review of the poetry of the century's early years could be called complete without mention of the names of **Walter De La Mare** (1873-1956), **Alfred Noyes** (b. 1880), and **Lascelles Abercrombie** (1881-1938). The poetry of De La Mare is steeped in a faery quality. The poet appears to move in a world of enchanted imagination. Moreover, he has the rare power of entering sympathetically into the working of the child mind, and his collection *Peacock Pie* is deservedly popular with children. His pleasant variety can be appreciated most fully by a study of his collected works. The painstaking work of Alfred Noyes, whose first volume of verse, *The Loom of Years*, appeared in 1902, won him higher praise in America than in his native land. He is a fine lyrist, and one of the few 20th century poets to attempt an epic ("Drake") in blank verse. "The Torch Bearers" (published 1922-30) records in blank verse interspersed with lyrics the achievements of the great pioneers of thought and discovery. This represents his most ambitious work and is probably his masterpiece. Abercrombie specialised in poetic drama, on themes often distressing and sometimes full of horror, in no wise relieved by the strength of his presentation. He employed a highly distinctive vocabulary. The most varied collection of his work is *Emblems of Love*.

Others of the same generation whose work the wise student will note include CHARLOTTE MEW (1870-1928), JAMES ELROY FLECKER (1884-1915), LAURENCE BINYON (1869-1943), MAURICE BARING (1874-1945), and SIR JOHN SQUIRE (b. 1884).

LESSON 25

Twentieth-century Poetry—II

In the work of all, or almost all, of the 20th-century poets noticed in the previous Lesson, there is detectable, as befits its period, a note of revolt—revolt against the Tennysonian tradition and certainly against both the moral earnestness prevailing for the greater part of the Victorian era and that lack of it which inspired the preciosity of the poets of the decadence. Poetry seems to have felt the urge to discover and exploit new themes and new moods, to discover new beauty in what was unconventional, unexpected, and even commonplace. Poets no longer repressed either their laughter or their anger. The work, in particular, of Kipling, Masefield, Chesterton, and Belloc probably brought poetry more closely within the grasp of the ordinary man, attuning it more completely to everyday notions than it had been since the 17th century.

First World War—and After

This process inevitably reached its culmination with the First World War, when the heightened sensations of a whole people under duress found its most characteristic expression in one form or another in the work of the so-called "war poets," both those who reflected patriotic ardours and those who later gave voice to the bitterness of disillusionment. Of the first, one need only mention **Rupert Brooke** (1887-1915), whose sonnet, "If I should die," is likely to endure as an immortal English poem. Brooke is usually classed as a "war poet" because he died on active service, a young man who had already revealed his intense joy in life and his alertness to physical delight, a poet who was also an athlete, a dreamer who sought adventure in travel and war. All this, together with the romantic fact that he had fittingly penned his own epitaph, served to establish him as a symbol for all the sad waste of promising young life that the war entailed. Yet the most characteristic poems in his limited output, such as "Grantchester" and "The Great Lover," had been written before the war.

The later kind of "war poetry" is found in the passionate lyrical protests of **Wilfred Owen** (1893-1918) and the bitter, angry verses of **Siegfried Sassoon** (b. 1886). Owen was killed on the western front one week before the armistice. Sassoon, another serving soldier, in addition to his moments of invective, could also express the


Rupert Brooke


Humbert Wolfe


T. S. Eliot


W. H. Auden

strange beauty of quiet moments amid the horrors. **Robert Nichols** (b. 1893) and **Edmund Blunden** (b. 1896) were no less uncompromising in depicting the grim circumstances of war, but they saw them more steadily, the emotion that inspired their verses being less passionate than compassionate

The war over, and the war poems all published, what was left was a mood of disillusionment. No brave new world materialised, and there was little to inspire the poets. Some found refuge in satire. One such was **Humbert Wolfe** (1885–1940), possessed of a mordant wit, whose *Lampoons* appeared in 1925. He had already achieved some reputation with *London Sonnets* and *Kensington Gardens*. His most characteristic work, also his most ambitious, is *The Uncelestial City*, a long poem in various metres, satirical in its implication, deft and often beautiful in its treatment.

But by that time **Thomas Stearns Eliot** (b. 1888) had emerged as a major poet with " The Waste Land " (published 1922), and the story of English poetry had taken, for better or worse, a new turn. Eliot, born in the U.S.A., and naturalised as a British subject in 1927, has been acclaimed as the leading spirit in the poetry of his time, and his work therefore demands some consideration.

Even after thirty years, most readers find " The Waste Land " obscure– even though the poet added explanatory notes which do not appear to make it any clearer. The poem is 433 lines in length, and has 50 annotated references and other literary and historical allusions, and includes quotations in five different languages (Sanskrit is one) Its rhythm is varied, and the phrasing is elliptical. The whole poem is a comment on contemporary civilization. But its obscurity and unquestionable difficulty ensured that its message made an impact only on the few. Indeed originally it appealed to only a very select literary coterie ; and because it eventually exercised so marked an influence on younger poets, it has served to divorce poetry in general once again from the ordinary reader.

Of Eliot's method, one critic (Hugh Ross Williamson) writes :

> In endeavouring to communicate his vision to his readers, he relies not on a subjective expression of his own emotions but on finding an objective standard of reference which he called " the objective correlative " —which will evoke the same response from both writer and readers. This objective correlative may be an historical incident, a person a phrase from another writer, a classical allusion, a reference to an anthropological treatise, the chorus of a popular song, a piece of popular devotion Many of his poems have thus a superficial appearance of plagiarism or parody , and nearly all contain recondite literary allusions which present problems to those less erudite than himself

In one of his most satisfying poems, " Little Gidding," Eliot explains his own ideal in the use of words as a form of writing

> Where every word is at home,
> Taking its place to support the others
> The word neither diffident nor ostentatious,
> An easy commerce of the old and the new,
> The common word exact without vulgarity,
> The formal word precise but not pedantic,
> The complete consort dancing together

His volume of *Collected Poems* 1909 1935 included " Sweeney Agonistes." His *Ash Wednesday* is a sequence of religious poems, and indeed after " The Waste Land " the main preoccupation of his thought and work was a mysticism which finds its culmination in four further works : " Burnt Norton," " East Coker," " The Dry Salvages," and " Little Gidding."

Here are his own words, written in 1941, on the general tendency of so-called " modern " poetry, upon which his influence has been so strong :

> We may take as within the term of modern poetry the work of those writers who had arrived at individual form and idiom during the four or five years immediately preceding the last war Those who first found their speech during that war – whether we call them " war poets " or not form a second age group ; and since 1918 at least two other poetic generations can be distinguished. One thing that must strike the reader of the last twenty years is the rapidity with which one literary generation has followed another ; and as each poet has continued to develop his own style, the impression may well be confusing. For this acceleration of change . . . the cause . . . is to be found, if at all, in the history of a changing and bewildered world . . . An explanation of what makes modern poetry would have to be an explanation of the whole modern world.

Another poet, W. B. Yeats, had this to say about it:

> Ten years after the war [i.e. the First World War] certain poets combined the modern vocabulary, the accurate record of the relevant facts, learnt from Eliot, with the sense of suffering of the war poets, that sense of suffering no longer passive, no longer an obsession of the nerves; philosophy had made it part of all the mind. . . . They may seem obscure, confused, because of their concentrated passion, their interest in associations hitherto untravelled.

Here is a further defence of "difficult" poetry, this time from Michael Roberts, prefacing an anthology (1932):

> It was inevitable that the growth of industrialism should give rise to "difficult" poetry. Because our civilization has hitherto depended directly on agriculture, and because our thoughts have hitherto made use of images taken from a rural life, our urban and industrial society leaves us uncomfortable and nostalgic . . . The poet is . . . a person of unusual sensibility, he feels acutely emotional problems which other people feel vaguely, and it is his function not only to find the rhythms and images appropriate to the everyday experience of normal human beings, but also to find an imaginative solution of their problems, to make a new harmony out of strange and often apparently ugly material.

The editor of another anthology, Janet Adam Smith, also touches on the matter of obscurity, making a somewhat different point.

> A supposed incomprehensibility is the charge most often brought against modern poetry. (But) too great an emphasis on factual meaning may make the reader blind to the other qualities of a poem; it is possible to enjoy long before we comprehend.

This may be so, but it seems unfair to put the onus on the reader. It suggests an attitude of mind on the poet's part which could be epitomised as "Never you mind what I am trying to say—that's my business, not yours; you must just be content to enjoy the way I say it." One hesitates to believe that more than a negligible minority would subscribe to such a formula.

It would seem that English literature now awaits the coming of some new genius who, while perhaps accepting all these premises about the apparent confusion and ugliness of contemporary civilization and certainly inheriting all that is most stimulating and admirable in contemporary poetry—its passion, its liveliness, its enterprise in the discovery of new associations and in the invention of new images and even new words (or "neologisms," as they are pedantically called)—will yet be able to rescue poetry from those enclosing, exclusive walls, and make it once more a means of communication rather than an exercise in the esoteric.

Meanwhile for what has been referred to as "all that is most stimulating and admirable in contemporary poetry" the student is referred to the work of such writers as W. H. AUDEN, the South African ROY CAMPBELL, WILLIAM EMPSON, JOHN LEHMANN, CECIL DAY LEWIS, SIR HERBERT READ, DAME EDITH SITWELL, STEPHEN SPENDER, and DYLAN THOMAS. There are others, but these would be generally acknowledged as "indispensable" names for those who would really seek to be aware of the direction in which English poetry is moving at this day.

LESSON 26

English Prose: The First Eight Centuries

THE student confronted for the first time with even an elementary work on English prose may well ask himself why he should study it. What is the use, for example, of an anthology of English prose? Is it compiled in order that the reader of it may be enabled to form some idea of the origin and development of the language at various periods of its history? Yes, and no. Philological considerations do not enter into such a work.

There is as much fascination attached to the study of the growth of a language as there is to the pageant of history. But classic prose is also studied not only for the light it sheds upon the time in which it was written; not merely because of its intrinsic value as a means of knowledge; but also because of its style. And for yet another reason—which some would place above all the rest—because behind the style is a living man. Herein, for the true student of literature, is the essential attraction of standard literature, and especially of standard prose.

Sooner or later one discovers that the eloquence, the rhythm, the colour, the tone, the deft management of the period, are largely modelled by the great masters of English prose upon the works of men who wrote in Greece and Rome and the East some twenty centuries or more ago. But that is no cause for withholding a tribute of grateful admiration. What is allowed to the plastic artist, the painter, the sculptor, the architect, cannot be denied the artist in words. All highly developed art is rooted in classical tradition.

More Personal Than Poetry

Approaching a work of living prose, one may be certain that behind it is a great man, and something more—something of the character of the best of that man's contemporaries, of the spirit of the age in which he lived. Genius is the same in all ages, and writers in the rudest times, as well as those in more polished and enlightened eras, reached limits beyond which the

faculties of the human mind seem unable to penetrate. Thus the elements of thought are only conditioned, not governed, by the outward circumstances of their expression.

Verse has been, certainly in English, far ahead of prose in the matter of settled law. Hence the rhythm of Spenser is not in any way archaic, and can be imitated to-day without any risk of seeming old-fashioned. No cadence in modern verse is more pure, more perfect, than that of Shakespeare's sonnets and lyrics. But the prose of the masters and makers of it is even more personal : it cannot be imitated.

All that can be attempted in the space available here is to indicate where the student must look for the leading examples of English prose, and to point out briefly the principal stages of prose development.

Earliest English Prose

The leading characteristic of Anglo-Saxon prose reflects a leading ingredient in the English character practicality. The language was direct and simple. Another point to be borne in mind is that right down to, and including, the 16th century, English prose writers were, in the main, translators Their works were almost always educational, religious, or historical.

The coming of **Alfred the Great** (849-901), who reigned over Wessex from 871 until his death, brought with it new life for English letters. Alfred relates that at the time of his accession no scholar could be found south of the Thames who could even read the Latin service books of the Church. The king gathered round him scholars from all parts and sent competent teachers to the monasteries. He himself began to translate Latin books into the West Saxon language, bringing in comment and original matter of his own. Among the books he translated and edited were : (1) *The Handbook*, a collection of extracts on religious subjects ; (2) the *Cura Pastoralis* of Gregory the Great, with a Preface by himself, which has the distinction of being the first piece of native English prose ; (3) Bede's *Ecclesiastical History of the English* ; (4) Orosius's *History of the World*, which he brought up to date with accounts, taken down from direct narration, of the celebrated voyages of Ohthere to the White Sea and of Wulfstan to the Baltic ; (5) *The Consolation of Philosophy*, by Boethius. Of the last-named work Chaucer also made a translation.

One of the most important pieces of work due to Alfred's inspiration, and of which some portion was probably written by himself, is the Anglo-Saxon Chronicle. This became a contemporary document giving a summary account of the historical events of each year, and it continued until 1154. Not only is it an historical document of the highest importance, but it is of great value to the philologist in showing the continuous development of the language from the accounts of fighting between Alfred and the Danes to the story of the deplorable state of England at the end of Stephen's reign. A national possession without parallel, it should be a source of pride to every Englishman.

The importance of Alfred's work for English literature and scholarship cannot be overrated. He was, in truth, not only king of Wessex, but also king of English letters.

During the 10th century the most important writer was the scholarly monk Aelfric, who wrote vigorous homilies in a flexible prose. Apart from his work and some notable translations from the Bible, there is no outstanding prose dating from before the Norman Conquest.

Middle English—and Dialects

To the development of Old English a period is placed covering the Danish and Norman conquests and on through the years 1150 1350. During the first of these two centuries the old inflections were broken up, and in the second, numerous French words were incorporated in the English language. Middle English, of which Chaucer was the great literary artificer, flourished from 1350 to 1500, and since the latter date both language and literature are classed as Modern English.

Language differed somewhat then, as now, according to the part of England in which it was spoken. A Yorkshireman still uses a dialect markedly different from that of his Cockney relative, both in pronunciation and in idiom. In those more distant days the dialects spoken by those who lived north of the Humber, in the Midlands, in East Anglia, in Kent, in the South, and in Wessex, showed even greater divergences. It was the East Midland dialect which finally triumphed. The universities of Oxford and Cambridge, and the growing city of London, came within its influence, and in Chaucer's day it became the literary language of England.

The writers of the 14th century, like their Anglo-Saxon and Early English predecessors, concerned themselves chiefly with the work of translation. Several of Chaucer's works are of this nature two of the famous *Canterbury Tales* : "The Tale of Melibeus," borrowed from Albertano of Brescia, and "The Persones (Parson's) Tale," a sermon derived from Frere Lorens ; the unfinished *Treatise on the Astrolabe* ; and his *Boethius*.

Old Religious Treatises

The prose of this period is neither distinguished nor extensive. *The Ayenbite of Inwit* or *Remorse of Conscience*, is a translation from the French by Dan Michel, a monk of Canterbury. Richard Rolle, a hermit, wrote prose on religious matters. Some of this has been considered of

such value as to justify the recent publication of a modernised version of a portion of his theological essays. *The Wohunge of Ure Lauerd* (The wooing of Our Lord), and *The Ureisun* (orison) *of God Almihti* show more than usual merit. But the most widely popular religious work in prose was *Ancren Riwle* (anchoresses' rule), which by its homeliness and fervour makes a very direct appeal. As an example of its style, here is a very brief extract (in modernised spelling) from the address of Christ to the Soul :

> If thy love be sold, I have bought it with love above all other. And if thou sayest that thou wilt not value it so cheaply, but thou wilt have yet more, name what it shall be : set a price upon thy love. Thou shalt not say so much that I will not give thee much more for thy love. Wilt thou have castles and kingdoms ? Wilt thou rule the world ? I will do better for thee, I will make thee, with all this, queen of heaven

Latin Prevails

By this time Paris university had become famous, and its influence was widespread. Later it was to form a link with Oxford Latin was the *lingua franca* of the learned world, and the language of instruction used at the universities Thus, to whatever university a student went, a knowledge of Latin opened the door for him in the subject he wished to study. Naturally, too, through the work of the universities and the influence of the Church, which conducted its services in Latin, a considerable number of books were written in that language. We are not here concerned with their literary aspects ; but their subject-matter had an important influence on the medieval mind.

It was also the time when men were beginning to make European reputations as scholars. One such example was Peter Abelard (1079-1142), a lecturer in the University of Paris. Among his English pupils was John of Salisbury, who was in the service of Thomas Becket, and is said to have been with that archbishop when he was murdered John became Bishop of Chartres, and wrote a number of learned treatises in Latin.

That the French influence was by no means a negligible quantity is evident from the work of Chaucer alone. After Chaucer's death, however, the French wars and the Wars of the Roses once more set back the clock of literary activity, and there is little of interest to chronicle, save the introduction of the printing press by William Caxton (*c.* 1422-91), until the age of the Tudors, whence may be dated the beginning of Modern English.

LESSON 27

Early Masters of English Prose

ONE example of the manner in which the English appropriated French literature is to be found in the anonymous translation of *The Voyage and Travels of Sir John Mandeville*, who assumed the name of Jehan de Bourgogne, a work which is still read on account of its naïve descriptions of the marvellous. This book is a remarkable literary forgery and may possibly be the work of Jean d'Oultremouse, a writer of history and fables. But it is especially interesting to ponder the influence of the romantic legends of the Norman poets known as the trouvères. These deal with Alexander the Great, King Arthur and the Knights of the Round Table, Charlemagne, and the Crusaders.

The origin of the Arthurian legends is Celtic —partly Welsh and partly Breton. *Morte d'Arthur*, by **Sir Thomas Malory,** 1470, so delighted the heart of Sir Walter Scott that he described it as being indisputably the best prose romance of which the English language can boast. Many writers of the 19th century, Tennyson among them, are eternal debtors to Malory, whose work, printed with all the affection of a great and sympathetic craftsman by William Caxton, played no small part in the making of Elizabethan prose.

For his black-letter folio of this work—of which only two copies are known to exist, though a number of reprints are obtainable—Caxton wrote a preface, in which he said, in language that indicates the rapidity of the change from Chaucer's :

> I have after the symple connyng that God hath sente to me, under the favour and correctyon of al noble lordes and gentylmen, enprysed to enprynte a book of the noble hystoryes of the said kynge Arthur, and of certeyn of his knyghtes, after a copye unto me delyvered, whyche copye syr Thomas Malorye dyd take oute of certeyn bookes of Frensshe and reduced it into Englysshe And I, accordyng to my copye, have doon sette it in enprynte, to the entente that noblemen may see and lerne the noble acts of chyvalrye, the jentyl and vertuous dedes, that somme knyghtes used in tho dayes, by whyche they came to honour, and how they that were vycious were punysshed, and often put to shame and rebuke, humbly bysechying al noble lordes and ladyes, wyth al other estates, of what estate or degree they been of, that shal see and rede in this sayd book and werke, that they take the good and honest actes in their remembrance, and to folowe the same

A favourite passage from Malory's own text is his account of the passing of Arthur. How English it is, apart from the spelling, may be gathered from this modernised extract :

> And when they were at the water-side, even fast by the bank hoved a little barge with many fair ladies in it, and among them all was a Queen, and they all

had black hoods, and they all wept and shrieked when they saw King Arthur. "Now put me into the barge," said the King, and so they did softly And there received him three Queens, and in one of their laps King Arthur laid his head, and then that Queen said, "Ah, dear brother! why have ye tarried so long from me? Alas, this wound on your head hath caught overmuch cold." . . . Then Sir Bedivere cried, "Ah, my lord Arthur, what shall become of me now ye go from me, and leave me here alone among mine enemies?" "Comfort thyself," said the King, "and do as well as thou mayst; for in me is no trust to trust in For I will go into the Vale of Avillon, to heal me of my grievous wound And if thou hear never more of me, pray for my soul."

Malory's monumental work, following that of Chaucer and Gower, gave to English literature something of the glamour of chivalry and romance; and this influence was followed in its turn by the translation of Froissart's *Chronicles* by **Lord Berners** (1467 1533), who also translated *The Golden Book of Marcus Aurelius*.

Jean Froissart, like one of his own heroes, set out on his travels in quest of adventure. He visited England twice, in the reigns of Edward III -when he was secretary to Queen Philippa for some years -and of Richard II; he was the guest of David Bruce in Scotland; he journeyed in Aquitaine with the Black Prince, and was in Italy, possibly with Chaucer and Petrarch. Ten years before his death he settled in Flanders. His *Chronicles* deal with the period between 1326 and 1400, and are drawn from his travels and experience. They are among the most vivid and picturesque things in European literature. Sir Walter Scott considered his history had less the air "of a narrative than of a dramatic representation."

The student of 15th-century England should not omit to pay some attention to the *Paston Letters* (1422 1509). These documents, about a thousand in number and not printed in full until the present century, were written during the reigns of Henry VI, Edward IV, Richard III, and Henry VII, by members of an East Anglian family. They not only throw a flood of light on the social customs of 15th-century England, but show that the civil strife of the Wars of the Roses which then divided families did not altogether crush out either the desire for, or the means of, learning.

Sir Thomas More (1478-1535) was a man whose thoughts were far in advance of his time. His theories were essentially those of a humane man and a philosopher; his practice, as chancellor to Henry VIII, was at variance with his avowed sympathies, but undoubtedly he was bound by the legal conventions of his period. He was beheaded for refusing to acknowledge any other head of the Church than the Pope. His best known work, *Utopia*, a political satire, was written in Latin and translated into English by Ralph Robynson 35 years later. It deals with the social defects of English life, and pictures an imaginary island where communism is the rule, education common to the sexes, and religious toleration general. The title is derived from two Greek words meaning "nowhere." More also wrote a number of English works of which the most notable are his *Historie of Richard the Third* and his *Dialogue* against Lutherans.

As the Anglo-Saxons had fought against the influence of Norman-French, so **Roger Ascham** (1515-68), tutor to Elizabeth I and afterwards her secretary, reflected the native English spirit in his vigorous prose and his antagonism to the "Italianate Englishman," who modelled his conduct and his studies on what he or others brought back from Italy in those early days of Continental intercourse and travel. Ascham was devoted to the old English pastime of archery, and wrote a defence of it in English, *Toxophilus*, which he dedicated to Henry VIII, adding an address to the gentlemen and yeomen of England, in which occurs a passage that forms at once an apology for, and a defence of, his native tongue:

As for the Latin or Greek tongue everything is so excellently done in them that none can do better, in the English tongue, on the contrary, everything is in a manner so meanly, both for the matter and handling, that no man can do worse

He that will write well in any tongue must follow this counsel of Aristotle, to speak as the common people do, to think as wise men do

There are several important works on education which belong to the 16th century, but Ascham's *Scholemaster* is the first in point of time, and contains not a little advice of which the value is permanent.

In this connexion the following excerpt from *Toxophilus* has interest, but it is also valuable to the student as an illustration of Ascham's easy and pointed style:

If men would go about matters which they should do and be fit for, and not such things which wilfully they desire, and yet be unfit for, verily greater matters in the commonwealth than shooting should be in better case than they be . . . This perverse judgment of men hindereth nothing so much as learning, because commonly those that be unfitted for learning be chiefly set to learning As if a man nowadays have two sons, the one impotent, weak, sickly, lisping, stuttering, and stammering, or having any mis-shape in his body, what does the father of such one commonly say? This boy is fit for nothing else but to set to learning and make a priest of. . . This fault, and many such like, might be soon wiped away if fathers would bestow their children always on that thing whereunto nature hath ordained them most apt and fit.

Henry VIII, who encouraged Ascham, must also have it placed to his credit that he gave similar aid to **Sir Thomas Elyot** (*c.* 1490-1546), who wrote *The Governour*, the first book on the subject of education written and printed in English. The first Latin-English dictionary was compiled in this reign.

LESSON 28

Religion's Part in the Shaping of English Prose

As poetry, in a chronological sense, takes precedence of prose in the history of English literature, so religious works precede secular in influencing the growth of English prose. The services of the early translators of the Bible cannot be overestimated. First among them was **John Wycliffe** (*c.* 1325-84). It is important to remember, however, that neither Wycliffe's Bible nor any of its successors was the work of one man, although "Wycliffe's Bible," "Tyndale's Bible," and "Coverdale's Bible" are common terms. According to Cardinal Gasquet, Wycliffe's Bible was the work of the English bishops.

Before Wycliffe's time only portions of the Scriptures had been translated into English. Wycliffe—to follow the accepted story—set himself a few years before his death to the task of producing the first complete English Bible. By 1382 he had completed the New Testament. His friend Nicholas of Hereford translated most of the Old Testament and the Apocrypha. John Purvey, a pupil of the Reformer, revised the work four years after Wycliffe's death. The translation (or paraphrase), which was made from the Vulgate (or Latin version), was originally issued in manuscript form; of this, 150 copies are still extant. Written as it was for the common people, it is remarkable to find with how much ease Wycliffe's Bible can still be read. Wycliffe was a Yorkshire man, and it is told that when, some years ago, several long passages were read to a congregation in Yorkshire, not only were they understood by the hearers, but almost every word was found to be still in use.

The work of Wycliffe was carried on and improved by **William Tyndale** (*c.* 1492-1536), a pupil of Erasmus, the great co-worker with Martin Luther in the Reformation. When Erasmus published his Latin version of the New Testament in 1516 he declared:

> I long that the husbandman should sing portions of them (the Gospels) as he follows the plough, that the weaver should hum them to the tune of his shuttle, that the traveller should beguile with their stories the tedium of his journey.

Tyndale, who was a good Greek scholar, studied Hebrew for the purpose in hand, and, while consulting the Vulgate, went back to the originals as the basis of his version. He was helped in his task by a fugitive friar named Roy and others. It was Tyndale's Bible which, revised by **Miles Coverdale** (*c.* 1488-1568)—the first complete printed English Bible—and edited and re-edited as Cromwell's Bible (1539), and Cranmer's Bible or The Great Bible (1540), was set up in every parish church in England, in some cases being chained to the lectern—hence the term "Chain Bible."

The Bible, to quote Stopford Brooke, "got north into Scotland and made the Lowland English more like the London English. It passed over to the Protestant settlements in Ireland." After its revision in 1611, it went as the Authorised Version with the Puritan Fathers to New England and fixed the standard of English in America.

In Edward VI's reign **Thomas Cranmer** (1489-1556), edited the English Prayer Book (1549-52). "Its English," Stopford Brooke notes, "is a good deal mixed with Latin words, and its style is sometimes weak or heavy, but on the whole it is a fine example of stately prose. It also steadied our speech."

The development of English rhetoric and English philosophic and religious thought during

John Bunyan

Thomas Hobbes

Richard Baxter

John Locke

the 16th and 17th centuries may be studied in the writings of **Hugh Latimer** (*c.* 1485–1555), bishop of Worcester, whose sermons well sustain the homely and direct character of his native tongue; **John Knox** (*c.* 1505–72), the Scottish reformer and historian; **John Foxe** (1516–87), whose *Actes and Monuments*, commonly known as Foxe's Book of Martyrs, "gave to the people of all over England a book which, by its simple style, the ease of its story-telling, and its popular charm, made the very peasants who heard it read feel what is meant by literature"; **Richard Hooker** (*c.* 1553–1600), author of *The Laws of Ecclesiasticall Politie*, a great theologian whose memory is enshrined in Walton's *Lives*, and whose character is fitly indicated on his monument at Bishopsbourne, Kent, as "judicious"; and **Jeremy Taylor** (1613–67), bishop of Down and Connor, the author of *Holy Living* and *Holy Dying*, and a voluminous writer who, in the words of his friend Bishop Rust, of Dromore, "had the good humour of a gentleman, the eloquence of an orator, the fancy of a poet, the acuteness of a schoolman, the profoundness of a philosopher, the wisdom of a chancellor, the reason of an angel, and the piety of a saint."

Equally important to the student of English literature are the writings of **Thomas Hobbes** (1588–1679), a philosopher who applied the principles of geometry to the judgement of human conduct and in his *Leviathan*, *De Cive*, *Treatise on Human Nature*, and other works, showed himself to be "the first of all our prose writers whose style may be said to be uniform and correct and adapted carefully to the subjects on which he wrote." **Thomas Fuller** (1608–61), in his best-known work, *Worthies of England*, shows admirable narrative faculty "with a nervous brevity and point almost new to English, and a homely directness ever shrewd and never vulgar." The jurist **John Selden** (1584–1654), a distinguished scholar, is memorable for his *Table Talk*.

Sir Thomas Browne (1605–82) was a Norwich physician of whom Sir Edmund Gosse said: "Among English prose writers of the highest merit there are few who have more consciously, more successfully, aimed at the translation of temperament by style." His *Religio Medici* shows profound spiritual insight, expressed in glowing imaginative prose, *Hydriotaphia, or Urn Burial* is a discussion of burial customs, rich in imagery; and *Vulgar Errors* is an entertaining account of contemporary beliefs, in which shrewdness and credulity are happily blended.

John Bunyan (1628–88), the inspired tinker, most zealous of Puritans and author of some 60 books, is chiefly famous for his masterpiece *The Pilgrim's Progress*, in which Man tests all the delights of the world and all the resources of the intellect, rejects them as dangerous or inadequate, and finds religion the only sure road through life, even though beset with doctrinal dangers. The book sprang at once into fame, 100,000 copies being sold during the author's lifetime. The first part of it was written in Bedford jail, where as a dissenting preacher he had been imprisoned under the Conventicle Act. Next to *The Pilgrim's Progress*, Bunyan's most famous books are *The Holy War* and *Grace Abounding*; the former contains variations on the theme of his masterpiece, while the latter is an intimate autobiography, in which his deeply religious experiences are vividly described.

Another eminent Puritan writer is **Richard Baxter** (1615–91). His life is an example of self-help, and his writings are among the finest specimens extant of vigorous English. Of greater value to the general reader is **John Locke** (1632–1704), author of *Two Treatises on Civil Government*, *An Essay Concerning Toleration*, *An Essay Concerning Human Understanding*, and a work especially to be recommended to students on *The Conduct of the Understanding*. He is considered to be the unquestioned founder of the analytic philosophy of mind.

Gilbert Burnet (1643–1715), bishop of Salisbury, was author of a *History of the Reformation* and *History of My Own Times*, written from the Whig standpoint.

Discovered in manuscript form in the early years of the present century, the works of the mystic **Thomas Traherne** (*c.* 1636–74), show him as a remarkable poet and an even more remarkable prose-writer. Here is a passage from *Centuries of Meditation*:

> The corn was orient and immortal wheat which never should be reaped nor was ever sown. I thought it had stood from everlasting to everlasting. The dust and stones of the street were as precious as gold: the gates were at first the end of the world. The green trees when I saw them first through one of the gates transported and ravished me; their sweetness and unusual beauty made my heart to leap, and almost mad with ecstasy, they were such strange and wonderful things. The Men! O what venerable and reverend creatures did the aged seem! Immortal Cherubims! And young men glittering and sparkling angels, and maids strange seraphic pieces of life and beauty! Boys and girls tumbling in the street were moving jewels: I knew not that they were born or should die. But all things abided eternally as they were in their proper places. Eternity was manifest in the Light of the Day, and something infinite behind everything appeared, which talked with my expectation and moved my desire. The City seemed to stand in Eden or to be built in Heaven. The streets were mine, and so were the sun and moon and stars, and all the world was mine; and I the only spectator and enjoyer of it.

Everyone who aspires to a sound appreciation of our literature should have first-hand knowledge of these writers, not only because of what they teach of philosophy and theology, but because of their charm of style, their wisdom, their vision, and their humanity.

LESSON 29

English Prose in the 17th Century

Francis Bacon

Samuel Pepys

John Evelyn

Izaak Walton

Both Spenser and Shakespeare wrote some prose. Spenser's *View of the Present State of Ireland* is written in a most pleasing style. Shakespeare's prose has been the theme of many commentators. The student is recommended to study particularly the tavern scenes in *King Henry the Fourth*. The romance *Arcadia* and the *Defence of Poesie* of **Sir Philip Sidney** (1554-86) should also be studied in this connexion.

The first popular English history in the language was *The History of England to the Time of Edward III*, by the poet **Samuel Daniel** (1562-1619). After Daniel's work may be considered the *History of the World*, written during his imprisonment in the tower by **Sir Walter Raleigh** (1552-1618), and to be read for its human and personal interest more than on account of its intrinsic value as history. Edward Hyde, 1st **Earl of Clarendon** (1609-74), friend of poets like Jonson and Waller, wrote a *History of the Great Rebellion*. This was modelled on the style of the Roman historian Tacitus, and is notable for its biographical value.

The Life of Colonel Hutchinson, the Puritan, by his widow, **Lucy Hutchinson** (b. 1620), is one of the most delightful of biographies, with an historical character for subject. Taken up as a study, it will be read through for the charm and simplicity of the narrative.

To the domain of history and antiquarian study belong the writings of **William Camden** (1551-1693), **John Selden** (1584-1654), **John Stow** (*c.* 1525-1605), **Raphael Holinshed** (*c.* 1520-80), from whom Shakespeare drew much of his history, and **William Harrison** (1534-93). Mention must also be made here of the invaluable diaries of **Samuel Pepys** (1633-1703) and **John Evelyn** (1620-1706). Pepys's diary in the original, consisting of six volumes, was closely written in shorthand by the author, and was included in the collection of books and pictures bequeathed by him to Magdalene College, Cambridge. The shorthand MS. was not deciphered until early in the 19th century by the Rev. J. Smith, and the transliteration was first published in an abridged version in 1825. Besides throwing a brilliant light on the manners, personages, and events of the Restoration period—the diary deals with the years 1659-1669—it presents an amazing, because absolutely honest, psychological study of Pepys himself.

John Evelyn's diary (first published in 1818) covers a period of seventy years. His intellect remained fresh and vigorous to the last. His pen was a busy one, describing court life after the Restoration, travel scenes, and the countryside.

Familiar Letters, by **James Howell** (1593-1666), contains much contemporary history and displays both brilliant wit and keen observation. The letters represent the earliest-written series of English letters which may be styled literary. The exquisite epistles of **Dorothy Osborne** (1627-95), afterwards the wife of Sir William Temple, diplomatist and essayist, should be noted.

Next for consideration come the essayists and pamphleteers. The meaning of the word essay is a "testing." As understood to-day it might be defined as a valuation of a subject, usually of a literary or social nature, from the standpoint of the writer. The essays of Montaigne, the translation of which by **John Florio** (*c.* 1553-1625) preserves for English readers a vigorous and perennially delightful example of Elizabethan prose, hardly come within the limits of the essay.

The Elizabethan and Jacobean pamphlets were in a sense essays, but perhaps more distinctly can be discerned in them the beginning of the modern newspaper, because they were

published for controversial purposes. They form in themselves a somewhat absorbing branch of literary and historical study.

A number of the writers of these pamphlets also wrote tales, so that while the *Euphues* of Lyly is sometimes regarded as the earliest English novel, it is not quite isolated as an example of English prose narrative. Even if Sidney's *Arcadia* is left out of the question, there are the tales as well as the pamphlets of **Robert Greene** (*c.* 1558–?98); of **Thomas Lodge** (*c.* 1558–1625), whose *Rosalynde* inspired Shakespeare's *As You Like It*; and of **Thomas Nash** (1567–1601), whose *Jack Wilton* is said to have provided the prototype of Falstaff.

Londoners who wish to learn how their Elizabethan predecessors lived will find a world of entertainment in *The Gull's Hornbook*, by **Thomas Dekker** (1570–1637). The most interesting and permanent of all the pamphlets is **John Milton's** *Areopagitica*—so named after the Areopagus, the open-air court of Athens in which matters of public concern were freely ventilated—a trenchant plea for the liberty of the printing press. Another of the prose works of this great poet was *Doctrine and Discipline of Divorce*, in which he attacked the sacramental view of marriage and argued that incompatibility of character or contrariety of mind should be constituted just grounds for divorce.

The first of the English essayists proper is **Francis Bacon,** Lord Verulam (1561–1626). The student can have no better guide than is provided in the fiftieth of Bacon's 58 *Essays*—the one entitled "Of Studies"—full-charged with wise and practical advice, perfectly exemplifying Bacon's method and perspicuity of style:

> Histories make men wise, poets witty, the mathematics subtile; natural philosophy deep, moral grave, logic and rhetoric able to contend

Writing "Of Death," he says:

> Men fear death, as children fear to go into the dark; and as that natural fear in children is increased with tales, so is the other. Certainly the contemplation of death as the wages of sin and passage to another world is holy and religious; but the fear of it as a tribute due unto nature is weak . . . It is worthy the observing that there is no passion in the mind of man so weak but it mates and masters the fear of death; and therefore death is no such terrible enemy, when a man hath so many attendants about him that can win the combat of him. Revenge triumphs over death; love slights it; honour aspireth to it; grief flyeth to it; fear preoccupateth it; nay, we read, after Otho the Emperor had slain himself, pity, which is the tenderest of affections, provoked many to die out of mere compassion to their sovereign, and as the truest sort of followers

Of Bacon's essays Hallam declared that it "would be derogatory to any educated man to be unacquainted with them." They deal with the essentials of life as recorded by a man of the acutest intellect; they fail only where the intellect predominates unduly over the emotions.

Next to Bacon's essays should be ranked the *Discoveries* of **Ben Jonson,** which Swinburne prefers before them, and Professor Saintsbury describes as coming "in character as in time midway between Hooker and Dryden." Jonson's *Discoveries* have been too long neglected. There is a great deal in them concerning education and study that will generously reward the most careful attention.

After Jonson, considered as an essayist, come **Abraham Cowley** (1618–67), whose language is at once simple and graceful: and **Sir William Temple** (1628–99), whose essays (*Miscellanea*) contain much sensible matter written in an easy style.

It is difficult to classify *The Anatomy of Melancholy* by **Robert Burton** (1577–1640), but Jonson and Charles Lamb both greatly admired it; it is full of quaint and curious learning, of a profound earnestness, irony, and somewhat bitter humour. Burton explains that he wrote of melancholy "to comfort one sorrow with another . . . make an Antidote out of that which was the prime cause of my disease." *Microcosmographie*, a collection of character sketches by **John Earle,** bishop of Salisbury (*c.* 1601–65), is at once of social and philosophical value, but stands, like the *Anatomy*, by itself. Three other books that demand notice are the *Lives* and *Compleat Angler* of **Izaak Walton** (1593–1683), the first, a gem of literary biography containing the five lives of Donne, Wotton, Hooker, Herbert, and Sanderson, the whole forming one of Dr. Johnson's favourite books; the second, one of the earliest of "country books"; and the Autobiography of **Lord Herbert** of Cherbury (1583–1648), which Swinburne placed among "the hundred best books."

In the matter of criticism, pride of place as the first of the great English critics belongs to **John Dryden.** In the view of Lowell, Dryden, more than any other single writer, contributed, as well by precept as example, to free English prose from "the cloister of pedantry," and by his masterly handling to give it "suppleness of movement and the easier air of the modern world."

> His style [Lowell continues] has the familiar dignity so hard to attain, perhaps unattainable except by one who feels that his own position is assured. Swift was as idiomatic, but not so elevated; Burke more splendid, but not so equally luminous. That his style was no easy acquisition, though, of course, the aptitude was innate, he himself tells us, when he tells us that the Court, the College, and the Town must be joined in the perfect knowledge of a tongue.

The introductions to Dryden's works are specially worthy of study, as is the famous *Essay on Dramatic Poesy*.

LESSON 30

Prose Masters of the Early 18th Century

WHAT the prose of the 18th century may lack in colour and warmth, as compared with the prose of the 17th century, it gains in general smoothness, perspicacity, and correctness. It has been styled "aristocratic," and this description is in the main a true one. But during the greater part of this period the "aristocracy of intellect" was to a great extent employed in the furtherance of ends more practical, or at least more partisan, than literary. These ends were in part political, in part ecclesiastical, in part ethical. Thus the literature of the time should be studied in connexion with its political, religious, and social history. Journalism, which had its rise in the controversial pamphlets of Elizabethan and Jacobean times, received in the 18th century a new impetus, and the novel assumed a more definite shape.

Daniel Defoe (*c.* 1659–1731) is often regarded as the father of English journalism, and as a novelist the forerunner of Richardson and Fielding. To-day, except as the author of two or three books, one of them of world-wide repute, Defoe is half forgotten. In his lifetime, however, he played many parts, and over 250 distinct works bear his name. Numbers of pamphlets and treatises flowed from his pen. Educated as a dissenter, he had the cause of Protestant dissent at heart. As an able and vigorous controversial writer, he supported the Whig policy of William III against the High Church Tories. In the famous treatise, *The Shortest Way with Dissenters* (1702), Defoe with scathing satire advocated the complete extirpation of the dissenters, and this with such surface plausibility that his High Church opponents were at first deceived, and afterwards, being the more enraged against him because of their deception, secured his committal for trial at the Old Bailey, where he was sentenced to be fined and imprisoned during the queen's pleasure, and to stand three days in the pillory. Viewing him there, the sympathetic crowd, instead of insulting him, drank his health.

Robinson Crusoe and *A Journal of the Plague Year* (fictitious, but a masterpiece of reality) are enough to secure for Defoe pre-eminence as a master of the art of literary illusion. He had defects. He was curiously heedless of chronology; he was weak, on the whole, as a delineator of character. But he was an essential "realist," with creative imagination; immensely vigorous, clear-sighted, and dramatic, he remains one of the greatest of English writers.

As the author of *Captain Singleton*, *Moll Flanders*, *Colonel Jack*, and other works of a kindred character, Defoe stood brilliant sponsor to the novel of crime. In 1704 he started a *Review* which was the forerunner of *The Tatler*, *The Spectator*, and *The Rambler*. He has been called the typical journalist. His *Robinson Crusoe*, written when he was 58, is as immortal as *The Pilgrim's Progress* or *Don Quixote*. Like these two works and one other to be mentioned almost immediately, *Robinson Crusoe* can be read by the young for the narrative alone, and by older readers as an allegory. The sequel, less well known and inferior, possesses considerable interest.

As a pamphleteer **Jonathan Swift** (1667–1745) affords an interesting companion study to Defoe. Swift was by far the greater man. His power as a pamphleteer may be gauged by a consideration of the famous letters signed "M. B. Drapier," and familiarly known as the Drapier Letters (1724). In these compositions he attacked the iniquitous "job" by which a certain William Wood, a hardwareman and a bankrupt, was granted a patent for supplying

Daniel Defoe

Jonathan Swift

Sir Richard Steele

Joseph Addison

Ireland with copper coin. The Drapier Letters defeated this project; and though it is often said that the ensuing popularity of their author among the Irish people was unpalatable to him, his bequests to Irish charities seem to negative the idea that he had no sympathy for the people amid whom his lot was for a long time cast; he always sympathised with sufferers from injustice and had "a perfect hatred of tyranny and oppression," wherever he found it.

The Tale of a Tub is the most comprehensive example of all that is characteristic of his prose style. As sailors were supposed to throw out a tub to a whale to prevent it from colliding with their ship, so Swift thought by his tale to afford such temporary diversion to the wits and free-thinkers of his day as to prevent them from injuring the state by the propagation of wild theories respecting religion and politics. But his satiric genius, his fiery imagination, and his keen eye for the "seamy side" imparted to *The Tale of a Tub* qualities that disguised his avowed object, and at the very outset placed an insurmountable obstacle in the way of his ecclesiastical preferment.

The Battle of the Books, which, with *The Tale of a Tub*, helped to make Swift famous, takes a witty part in a controversy that was raging amongst his literary contemporaries over the respective claims of modern and ancient literature.

Something like one-fourth of Swift's most remarkable work, *Gulliver's Travels*, and a great part of his other writings, are marred by coarseness. But of *Gulliver's Travels* enough is so delightful as romance as to rival both *Robinson Crusoe* and *The Pilgrim's Progress*. While Defoe excelled in the art of making fiction read like fact, Swift, with the finest skill, cultivated a drastic simplicity and homeliness of style, the accumulated effect of which was so formidable as to afford a permanent object-lesson in the art that conceals art where the writing of nervous English prose is concerned. But with all its carefully calculated simplicity, the English of Jonathan Swift is never pedestrian or devoid of sparkle or variety.

Students of Swift's life will find in his work much that reflects his unhappy experiences. They will be especially indebted to the *Journal to Stella* (Esther Johnson, whose tutor he was) for many valuable pages of autobiography and for many sidelights on the manners of the time.

Sir Richard Steele (1672–1729), the friend and schoolfellow of **Joseph Addison** (1672–1719), was, like Swift, born in Ireland, but in this fact lies the sole resemblance between the saturnine dean of St. Patrick's and the genial "scallywag" who originated *The Tatler*, wrote part of *The Spectator*, founded *The Guardian*, and worshipped Addison.

In 1709 Steele started *The Tatler* anonymously. It was a small sheet, sold for a penny, appearing three times a week, and designed to expose "the false arts of life, to pull off the disguises of cunning, vanity, and affectation, and to recommend a general simplicity in our dress, our discourse, and our behaviour." Part of *The Tatler* was devoted to news. When his pen-name of Isaac Bickerstaff, which he borrowed from a diverting pamphlet by Swift, became useless as a disguise, Steele founded *The Spectator*. *The Tatler* extended to 271 numbers, of which Steele wrote 188; his friend Addison contributed 42, and they were jointly responsible for 36. *The Spectator*, which was published daily, ran to 635 numbers, of which Addison wrote 274 and Steele 240.

The wholesome effect of these publications on the manners of the period can hardly be exaggerated. Both the style of writing and the tone of conversation were improved as a result of their influence. Contrary to the custom of the time, women were treated in Steele's pages with respect. It is generally conceded that while Addison's style is the more polished, Steele's is more marked by liveliness of invention. Addison usually wrote at leisure, Steele often in a "white heat." The papers took the form sometimes of moral and critical discourses, sometimes of short stories of domestic life, in the writing of which, and as an essayist, Steele excelled.

The plan of *The Spectator* was based on a club, and the second number, written by Steele, gave the first sketches of the members. It is a remarkable testimony to the skill of Steele's work that the characters stand out so clearly before us. The immortal baronet Sir Roger de Coverley is understood to be Steele's invention. Steele, as Hazlitt remarked, seems to have gone into his study chiefly to set down what he observed out of doors. Addison, on the other hand, drew most of his inspiration from books. Not the least of Addison's services to literature was the attention he gave in *The Spectator* to Milton. These papers should be studied by all who desire to appreciate the style and value of literary criticism in Addison's time. On the whole Addison is read to-day less for the value of what he has to say as for the way in which he says it.

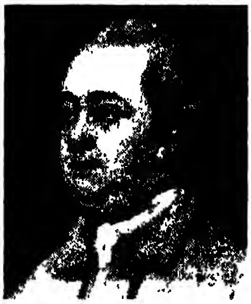
That his style is not without its defects goes without saying. He sacrificed everything to elegance, that is to rhythm or melody of phrase. At times he reveals a somewhat limited vocabulary and he is apt to repeat unnecessarily his ideas and his images. Occasional looseness of construction must also be attributed to him; but in an essay this is not without its advantages, for it conduces to a lightness of touch that is scarcely possible where the writer aims only at rounded periods.

There are not wanting those who think that Addison has long been something of a fetish among writers on literary style—" Read an essay of Addison's every day " has been the injunction of literary mentors for generations—and that in the not very distant future his chief interest will be historical. But such authorities as Johnson and Macaulay have weight concerning the high qualities of Addison's limpid style. Addison's sentences, according to Johnson, have neither studied amplitude nor affected brevity ; his periods, though not diligently rounded, are voluble and easy. " Never," said Macaulay, " had the English language been written with such sweetness, grace and facility." And if in the future his influence on individuals is less immediate, its effect on 18th-century prose can never be gainsaid.

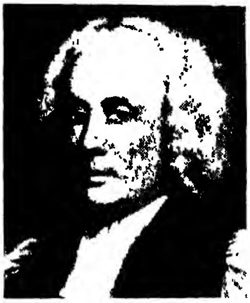
LESSON 31

Great Writers of the Johnsonian Age

Samuel Johnson



Edward Gibbon



Joseph Butler

Edmund Burke

The autocrat before whom every " quill-driver " quailed, **Samuel Johnson** (1709-84), poet, essayist, dramatist, biographer, critic, novelist, lexicographer, and the " Great Cham " of English literature, cannot be considered here in relation to his unrivalled position as a great and wise talker The student should refer to James Boswell's *Life of Samuel Johnson, LL.D.* as the only way of realizing Johnson's greatness. If one's leisure will not permit of reading the whole of his 600,000 words, an abridgement will serve.

As to Johnson's influence on prose literature, Macaulay says :

His constant practice of padding out a sentence with useless epithets till it became as stiff as the bust of an exquisite ; his antithetical forms of expression, constantly employed even where there is no opposition in the ideas expressed ; his big words wasted on little things , his harsh inversions, so widely different from those graceful and easy inversions which give variety, spirit, and sweetness to the expression of our great old writers --all these peculiarities have been imitated by his admirers, and parodied by his assailants, till the public has become sick of the subject.

Gibbon, the historian of Roman decadence, lived to write ; Johnson, an infinitely greater man, wrote to live. To-day the pages of Johnson's *Lives of the Poets* are read more, perhaps, than anything else he wrote, but not for the accuracy of their data or their infallibility of judgment. They disclose not so much fine literary instinct as fine human sympathy.

His prose tale of *Rasselas, Prince of Abyssinia*, written to defray the cost of his mother's funeral, has been aptly described as a prose version of his poem on " The Vanity of Human Wishes." According to Boswell, Johnson told his intimate friend Sir Joshua Reynolds that he composed *Rasselas* in the evenings of one week, sent it to press as it was written, and had never since " read it over." His great Dictionary was the first of its kind. It stands almost alone as the work of one man. Its value and influence have been great ; and even to-day, except for its weakness on the side of etymology, a weakness due to the fact that Johnson's Latin learning was not approached by his knowledge of Anglo-Saxon, it is a standard book of reference. The ordinary reader should have some acquaintance with *The Lives of the Poets ;* and *Rasselas* he is not likely to miss. For the rest, to know this grand old character in Boswell's biography is, as it was to love Sir Richard Steele's " Aspasia," a liberal education.

The friendship between Steele and Addison was not greater than that between Johnson and **Oliver Goldsmith** (1728-74). But no greater contrast could be imagined than that afforded by their writings. Sir Edmund Gosse says :

In prose style, as in poetic, it is noticeable that Goldsmith has little in common with his great contemporaries, with their splendid burst of rhetoric and Latin pomp of speech, but that he goes back to the

perfect plainness and simple grace of the Queen Anne men. He aims at a straightforward effect of pathos or of humour, accompanied, as a rule, with a colloquial ease of expression, an apparent absence of all effort or calculation.

Goldsmith's prose approximates to that of Addison. The best examples of it are to be found in his *Citizen of the World* and *The Vicar of Wakefield.* The first-named consists of a series of letters supposed to have been written by a Chinese resident in London, who was jotting down his experiences for the benefit of his friends in the Far East. The idea was not original, and it has since been imitated by innumerable writers, but the delightful wit and humour of Goldsmith's work have never been excelled. *The Vicar of Wakefield,* Goldsmith's chief prose work, is dealt with in a later Lesson, one of several concerned with the history of the English novel.

The period now under consideration, dominated as it was by humanism and intelligence, is rich in historians and philosophers. **George Berkeley** (1685–1753), bishop of Cloyne, was a man whose life, apart from his writings, is full of interest. As a philosopher he aimed at the overthrow of materialism (*see* the Course in Philosophy included in this Volume). He was an acute and original thinker; his style has great force and elegance, and he is a most accomplished writer of dialogue.

Joseph Butler (1692–1752), bishop of Durham, was the author of a work entitled *Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature* (usually referred to as Butler's *Analogy*), which won for him the name of "the Bacon of Theology," and remains a standard work in its own department. **David Hume** (1711–76) was distinguished as essayist, philosopher (*see* Course in Philosophy), and historian. He possessed wonderful clearness of mental vision, and his style is marked by exceptional lucidity. An opponent of popular government, he was yet the first of English writers to recognize the importance of social and scientific as well as constitutional and political factors in the making of history. His influence as a philosopher was most appreciable in Scotland and Germany.

The greatest of English historians was **Edward Gibbon** (1737–94), son of a Hampshire gentleman. After a preliminary education at Westminster, and fourteen "unprofitable" months at Magdalen College, Oxford, a whim to become a Roman Catholic brought about his banishment to Lausanne, where he spent five years, formed his taste for literary expression, and settled his religious doubts in a profound scepticism. It was in 1764, while musing amidst the ruins of the Capitol of Rome, that the idea of writing *The Decline and Fall of the Roman Empire* first started into his mind. The vast work was completed in 1787.

The manner in which Gibbon contrived a literary style that fitted the magnitude of his theme remains one of the marvels of English literature. Much nonsense has been written about its "pomposity." It moves with becoming gravity and produces a sense of formality which is impressive without becoming wearisome, and must by that token be most ingeniously varied without any appearance of effort at variety. There is a wonderful illusion of continued progress in the narrative, even when the essence of it is associated with things that are static. One is impressed with the drama of history; the historian seems by some subtle process of art to have fitted all the episodes of fourteen centuries into one congruous drama of humanity, and the multitudinous historic characters that tread his vast stage in a pageant beyond the dreams of imaginative poets, though shown in true historic perspective, are all endowed with their dramatic values to the furtherance of the grandiose scheme of the arch-director, who summons them back with such a wonderful illusion of life to re-tread the stage of history. Some would say, however, that Gibbon, in an age of intellectual riches and spiritual poverty, and by reason of his lack of temperamental sympathy, forgot his customary impartiality in the famous 15th and 16th chapters, in which he gave his view of the rise and spread of Christianity.

In spite of this, *The Decline and Fall* is one of the inevitable items in any list of books to read. Gibbon's *Memoirs* also make one of the books that should be read and re-read; it is held by some to be the best autobiography in English.

Edmund Burke (1729–97), an Irishman, was statesman and orator as well as author. Matthew Arnold described him as the greatest master of English prose style that ever lived. Apart from his speeches, Burke's principal prose works are: *A Vindication of Natural Society*, written to ridicule Bolingbroke's views on society and religion; *Inquiry into the Sublime and the Beautiful*; and *Reflections on the Revolution in France.*

Of all the 18th-century writers, perhaps Burke is the one whom the student can least afford to neglect. De Quincey, who was no hasty eulogist, considered him the supreme writer of his time. Whether that judgment can be entirely justified is not easy to show without entering into detailed comparisons between Burke and his contemporaries; but the fact remains that for much that makes for true citizenship, as well as for the literary graces, the student must have recourse to the works of Edmund Burke—his speeches no less than his

writings. Though his arguments may not always convince, the study of them will help marvellously towards an understanding of the public life of the country.

One must not be content, however, with knowing Burke in *The Sublime and the Beautiful*, which, though somewhat crude, is a notable contribution to aesthetics ; his *Reflections on the Revolution in France*, far less known to the ordinary reader, is even more worthy of study. It presents lucidly his horror of violence and his contention that liberty is to be admired only in the guise of order. His elegant speeches present a rich field whence knowledge of life and wisdom may be gleaned.

Horace Walpole, 4th Earl of Orford (1717–97), set up a private press, whence he issued *A Catalogue of Royal and Noble Authors*. He also wrote *Anecdotes of Painting in England* ; a tragedy, *The Mysterious Mother*; and a romance entitled *The Castle of Otranto.* He left nearly 3,000 letters and his *History of the Last Ten Years of the Reign of George II.* Walpole possessed a brilliant style, which will serve to keep his works alive and render his letters readable independently of their historical value.

Adam Smith (1723–90) wrote *The Wealth of Nations*, which originated the study of "political economy" as a distinct branch of science, inspired a world-wide interest in the sources of wealth, and was responsible for the rise of the theory of free trade. *The Wealth of Nations* is a book that can still be studied with pleasure and profit. It affords an example of the way in which a "dry" subject can be treated so as to appeal to the popular mind.

LESSON 32

Some 18th-century Scholars and Stylists

ENOUGH has now been said to make it evident that the study of English prose must be pursued on lines different from those followed in studying English poetry. Whereas poetry is universally the voice of inspiration, prose in its development departs from the sphere of literature proper. Sometimes retaining but frequently losing its claim as literature, it becomes in turn the servant of theology, the handmaid of history, the medium of science, the channel of philosophy—essential alike to religious and to atheistical propaganda, to practical and to theoretical ends.

At the beginning of the 18th century the student stands at a parting of the ways. He has to distinguish between what is prose *literature* and what is not. To a certain extent the answer will depend upon his own bent or humour, but he still has to ascertain why, when, and by whom particular books were written. He must not only learn the history of those books, but become acquainted with their relationships—their position in regard to the treatment by others of the subjects with which they deal—before he is able to satisfy himself as to their value.

Studying the Background

It is proper at this point to urge the advisability of some study of the political and social developments of which particular books were either a cause or an outcome. The extent of this study will depend largely upon the reader's desire to confine himself to, or to range beyond, the scope of *belles-lettres*. By *belles-lettres* is meant literature that is distinguished by the charm of its style or form, apart from its claim as a vehicle of instruction. In the last resort prose lives because of its power, not for its prettiness.

Charm and distinction of style are peculiarly characteristic of 18th-century prose. The century "found English prose antiquated, amorphous, without a standard of form : it left it a finished thing, the completed body for which," as Sir Edmund Gosse says, "subsequent ages could do no more than weave successive robes of ornament and fashion." The wider one's knowledge of the literature of this period grows, the more clearly one sees the injustice of the common indictment of the age as one of shams and sentiments. Apart from Johnson, the age of Berkeley, Wesley, and Whitefield cannot be described as devoid of enthusiasm.

Diversity of 18th-century Prose

It was the age of the great historians. It was adorned by some of the greatest philosophers and keenest critics. English writers of the time possibly influenced Continental thought more than did the writers of any other period of history. The 18th century standardised the essay, sowed the seeds of modern nature study and modern chemistry, gave birth to the great English novel, laid the foundations of English periodical literature, stood sponsor to the beginnings of daily journalism, and crushed the system of literary patronage. It was also the age of political economy and public eloquence.

The 18th century is also rich in its letters. The correspondence of Horace Walpole has been already referred to. Philip Dormer Stanhope, 4th **Earl of Chesterfield** (1694–1773), was a statesman and wit who is remembered to-day chiefly for his *Letters to His Son*. Given

to the world in 1774 by the son's widow, these letters were described by Johnson as displaying the morals of a courtesan and the manners of a dancing-master. They argue, nevertheless, despite their worldliness, a sincere solicitude for the welfare of the son to whom they were addressed. They furnish also an example of writing that is at once clear, simple, forcible, and polished. The aim of the writer is apparent throughout. The means he adopts to further that aim are direct. He describes things that are desirable, and against them sets the means by which they are to be attained. If the chance that ambition may not be sufficiently stimulated is sometimes provided for by an appeal to fear the fear of ridicule—the fact is not to be counted for affectation on the writer's part. To him the most important thing in life was to shine in the fashionable society of the period.

Among other letter-writers of the 18th century must be named the poets Cowper and Gray. The letters of Cowper perhaps afford the best argument against the effectiveness of ornamental diction when it is confronted with a style that is simple and sincere. Cowper's letters describe in the most natural and most charming of language the surroundings and incidents of the poet's life at Olney and Weston. Gray's letters possess the qualities of the bookman and the scholar, and represent a man who seems never to have permitted himself to appear in "dressing gown and slippers." The letters of **Lady Mary Wortley Montagu** (1689 1762) describe in the simple and elegant style of an accomplished if worldly woman her experiences of travel in Europe and the Near East in 1716 and 1718.

The Natural History of Selborne, by **Gilbert White** (1720 93), marks the beginning of popular nature studies. Probably no book on natural history has been more widely read or more loved. With just sufficient formality to give it 18th-century charm, it is composed of letters to the writer's friends, written, it is believed, at the suggestion of the Hon. Daines Barrington (1727 1800), who was an antiquary and a naturalist as well as a lawyer. **Thomas Pennant** (1726 98) was another famous naturalist; his *British Zoology* and *History of Quadrupeds* were for a long time considered classics.

Among the divines whose work continues to be read are **William Law** (1686–1761), whose *Serious Call to a Devout and Holy Life* stands by the side of Jeremy Taylor's *Rule and Exercises of Holy Living* as one of the most impressive devotional treatises in the language; **William Warburton** (1698-1779), bishop of Gloucester, author of a voluminous work entitled *The Divine Legation of Moses Demonstrated*; and **William Paley** (1743-1805), whose *Treatise on Natural Theology* and *View of the Evidences of Christianity*, popularly referred to as "Paley's *Evidences*," is still read. His *Horae Paulinae*, a defence of the genuineness of St. Paul's Epistles, is another important work.

Conyers Middleton (1683-1750) wrote a remarkably rationalistic *Free Inquiry* into the miraculous powers which were supposed to have existed in the Christian Church. His vigorous, direct style has many admirers. *Essay on Civil Society*, by Dr. **Adam Ferguson** (1723-1816), has been ranked as a companion to Adam Smith's *Wealth of Nations*. **Thomas Reid** (1710-96), who wrote *An Inquiry into the Human Mind on the Principles of Common Sense*, had a distinguished follower in the "common-sense" philosophy of **Dugald Stewart** (1753-1828).

Thomas Paine (1737-1809) wrote a highly influential book called *The Rights of Man* (1790) in answer to Burke, also *The Age of Reason*, the Bible of rationalistic deism. The latter was written in 1793, while Paine was a prisoner in Paris under the "Terror."

The Greek scholarship of Richard Porson and that of Elizabeth Carter, the translator of Epictetus; the translation of Demosthenes by Dr. Thomas Leland; the still unapproached translation of the Koran by George Sale; the version of Plutarch's Lives by J. and W. Langhorne; the standard translation of Josephus's *History of the Jews* by William Whiston; the still popular version of *Gil Blas* by Tobias Smollett; the translation of the Satires of Horace by Christopher Smart—all these testify to the high scholarship of the English 18th century

Even this list, long as it is, and irrespective of the fact that fiction and drama are reserved for separate consideration, while poetry has already been dealt with in this Course, is far from comprehensive. There yet remain to be noted for the student's attention Sir William Jones's translations from the Sanskrit, the scholarly *Discourses* of Sir Joshua Reynolds (originally lectures to students at the newly-founded Royal Academy), John Horne Tooke's valuable *Diversions of Purley*, the histories and biographies of John Strype, the *History of the Puritans down to 1689* of Daniel Neal, Sir William Blackstone's authoritative *Commentaries on the Laws of England*, the *Anecdotes* of Joseph Spence, Mrs. Thrale's *Anecdotes of Samuel Johnson*, the *Travels* of Mungo Park, the Shakespearean studies of Farmer, Steevens, and Dennis. Mary Wollstonecraft Godwin's *Rights of Woman*, published in 1792, was the forerunner of the literature which helped to win the suffrage for women. T. R. Malthus's *Essay on the Principle of Population* (1798) was afterwards to influence Darwin.

In the domain of journalism it is of interest to remember that *The Times*, first started as *The Daily Universal Register* in 1785, came out with its present title on January 1, 1788; that *The Gentleman's Magazine* was originated in 1731, a *Monthly Review* in 1749, a *Literary Magazine* and a *Critical Review* in 1756; while, in addition to other encyclopedias, the first *Encyclopaedia Britannica* appeared in completed form in 1771, in three volumes.

At this point one great distinction has to be noted between the 18th century and the 20th: the term "man of letters" stood for one who had ranged at will in all those fields of study represented in this review of 18th-century prose-writers—philosophy, travel, history, fiction, science, religion, and so on. Unhappily, but perhaps inevitably, the 19th century saw a great change in the direction of "specialisation," not only by writers, but also by readers. In the 18th century it was accounted no discredit to a writer that he expended his energies in many fields of thought. To-day such versatility is not always appreciated. That is the author's excuse, and perhaps a valid one; but the reader who confines himself to only one class of reading has no excuse. The man who would be well read to-day should go for example to the "men of letters" of the 18th century, who regarded the whole field of writing as their hunting-ground.

LESSON 33

A Survey of 19th-century Prose—I

ENGLISH prose of the 19th century, infinite in its variety of style, is distinguished by its rich complexity of matter and its widely contrasted points of view. Goethe's remark that there are many echoes but few voices is largely true of all literary periods; but the voices of the 19th century will compare advantageously with those of any preceding period. Where prose is concerned, they are heard at their most forceful in the novel. But they are hardly less resonant in the essay, the biography, the history, the book of theology, the narrative of travel, the scientific treatise, the study of philosophy, art, education, and economics. While a certain complacency, or easy optimism, was characteristic of some eminent writers, a greater number of eminent writers were loudly protesting against personal and national complacency, opposing such thought with a spirit of inquiry and unrest, with a passionate denunciation of social and human ills of every kind.

"The Renascence of Wonder"

If the 20th century opened with a wider mental outlook, it is due to the work accomplished during the preceding century in the domain of English letters, when the great writers took to heart the aphorism of an 18th-century poet. They saw with Pope that "the proper study of mankind is man."

The literature of knowledge and the literature of power belonging to this period are alike marked by a dominating but informed interrogative; for it was not only in imaginative writing that the last century witnessed what Watts-Dunton called "the Renascence of Wonder," but in all fields of literature—in criticism and science, no less than in poetry and romance—that this re-birth of wonder took place. The originator of the phrase thus explains it:

> The Renascence of Wonder merely indicates that there are two great impulses governing man, and probably not man only, but the entire world of conscious life the impulse of acceptance the impulse to take unchallenged and for granted all the phenomena of the outer world as they are and the impulse to confront these phenomena with eyes of inquiry and wonder

The causes of this change in the nation's literary life are worth a glance. The French Revolution shattered the scholastic formalism of English letters. Jean-Jacques Rousseau stirred up a feeling for humanity such as England had never before acquired from French or Italian writers, much as she had been previously influenced by Continental models. The effects of the Revolution threw the thoughtful back for a time into the slough of despond. In Lesson 20, for example, it has been noted how Wordsworth was bowed down in this way. Then a Scottish teacher read Mme. de Staël's *De l'Allemagne*, set himself to master the German language, put Jean Paul Richter in the place of Jean-Jacques Rousseau, and by the exercise on the one hand of the extraordinary knowledge he acquired of German philosophy and German individualism, and his painstaking elucidation of the Cromwellian epoch on the other, set aloft an ideal of manhood and patriotic duty which influenced materially the popular view of history, and the outlook on nature and life. This was Carlyle.

There were others who drank deeply at the Teutonic spring. Wordsworth was one, Coleridge another, Byron a third; Scott and De Quincey were of the company. Each was affected differently, but at the same time profoundly.

Had there been no "Renascence of Wonder,"

there would have been few, if any, of the marvellous inventions which rubricate the 19th century in the calendar of centuries. Romance was reborn; metaphysics acquired a new meaning; humour was reincarnated. Men longed to look at things as they were to see them whole. Carlyle entered as an iconoclast into the temple of "the Gigmanities," and of all the master-minds of the century Carlyle is the one who, both directly and indirectly, stirred most deeply the heart of the vast reading public called into being by the mechanical invention of "the wonderful century."

Enter the Literary Periodical

The history of the essay, both critical and constructive, now begins to be bound up with the history of the periodical. Something of the same kind may be said of both poetry and the novel. It becomes increasingly difficult to separate the essayist from the journalist. The essays of Lamb, Leigh Hunt, De Quincey, and Hazlitt, for example, were all originally contributed to various periodicals. Dickens, in the intervals of publishing his novels, created a mouthpiece for his miscellaneous writing by founding his own journal. He was proud of being a journalist, so was Thackeray. Macaulay's so-called literary and critical essays were reviews written for the magazines. And as most of the various periodicals had a political bias, if not indeed a political basis, literature developed more or less under the aegis of politics. The writers made the reviews, and the reviews helped to make the writers.

Journalism is by its nature fugitive. To-day much of the vital force which animated the work of earlier writers has been scattered, much of their thunder has been stolen, the knowledge in the light of which they wrote has been found to be misleading. But the saving salt of an individual style preserves many an old and obsolete book from the blight of oblivion.

Object Lessons in Style

Among other influences on later prose must be remembered the prose of the poets the prefaces of Wordsworth, the miscellanies of Scott, the critical essays of Coleridge, the letters of Byron, Shelley, and Keats. But the student has a wonderful variety of object lessons in style before him, apart from these great names. There are the Puritan fervour, the irony, and the grim humour of Carlyle, the gentle intimacy of Charles Lamb, the graceful confidences of Leigh Hunt, the aerial cadences of De Quincey, the emphatic, unmistakable vigour of Cobbett, the brilliant antithesis of the sometimes prejudiced, sometimes complacent, but always vitally interesting Macaulay, the incisive phrases of Hazlitt, the ornate imagery and deeply penetrative criticism of Ruskin, the flowing sea-music of Swinburne, the classic beauty of Landor's dialogues, the perfect serenity and harmony of Newman, the scholarly prose of Matthew Arnold, the undecorated diction of Hallam and Freeman, the picturesque pages of Froude, the jewelled sentences of Walter Pater, the gracious sparkle of Stevenson, and the austere prose of Charles Doughty, whose *Travels in Arabia Deserta* was for long so little known. In the main the prose writer who aspires to style must be an artist just as the poet is an artist, but ultimately the secret of the style is the harmony between subject and treatment.

For general purposes style itself has been generally influenced by the usage of journalism. The Press is responsible for a marked lessening of the distinction between written and spoken language. There must always be some distinction. The skilled writer must of necessity possess a close acquaintance with the meaning of words; and it is perhaps a defective knowledge of the meaning of words that lies at the root of most failures in composition.

The speaker, by means of accent, emphasis, look, gesture, personality, can lend significance to a comparatively poor speech. The writer is obliged to find literary equivalents for the methods and circumstances of platform and pulpit. Even a speaker on the radio can attract (or repel) attention simply by the quality or *timbre* of his speaking voice, this, too, is a power denied to the writer, who must perforce rely on other qualities to claim the attentive interest of a wide public. The conscientious writer seeks the perfection of a literary style that shall bear his own distinctive mark—his own, and no one else's, for a copied style is no more than a mask.

Due attention has already been given to the poetical work of **Samuel Taylor Coleridge** (1772 1834). With regard to his prose writings it has to be said that no serious student of English criticism can afford to neglect his *Lectures and Notes on Shakespeare*. They are valuable on account both of their high intrinsic worth and of the effect they had on later estimates of the national poet.

One of the greatest, as he is one of the least pretentious, of English prose-writers is **Charles Lamb** (1775 1834), author of the *Essays of Elia* Master of as many styles as he possessed moods, he is full of elusive echoes of the old writers whom he loved. Lamb was both an essayist of unique charm and a critic of insight and accuracy. He dared to be original in criticism and forestalled Chesterton and Shaw in the use of paradox.

William Hazlitt (1778 1830) was indebted to Lamb, and acknowledged the indebtedness,

Charles Lamb

William Hazlitt

Thomas De Quincey

James Leigh Hunt

but with a critical faculty as keen as that of Lamb he did not possess the same human sympathy; hence, whereas the one is loved, the other is given the meed of almost frigid praise. Yet Hazlitt's is a name of first importance. He is master of the apt and illuminating phrase. The student of Shakespeare owes much to Coleridge's *Lectures*, he owes much also to Lamb's *Critical Essays*, but he must also study with attention Hazlitt's *Characters of Shakespeare's Plays* a work dedicated to Lamb and his *Lectures on the English Comic-Writers* and *Lectures on the English Poets*.

Thomas De Quincey (1785 1859) has much to attract, but is dangerous to follow. He lacks a certain dignity, is normally without what is usually understood by the word "reverence," and is at times unduly discursive, but it should be remembered that the bulk of his work was anonymous journalism, and that the writer kept up a weak physique by the use of opium. His *Confessions of an Opium-Eater*, *Suspiria de Profundis*, the historical essays, and the *Autobiographic Sketches* should be studied. De Quincey has been styled the "Boswell of Essayism", so intimate are his revelations of both himself and his associates. He possessed an instinct for dramatic expression. Whatever some of whom he wrote thought of the character drawing, he was well liked personally. His valuable influence was against cast-iron formality in prose.

William Cobbett (1762 1835) started life by scaring crows, but left a name which should be remembered He may be said to personify the whole art of self-education. By self-denial and perseverance he acquired a considerable sum of varied knowledge, and wielded immense influence as a politician and journalist Despite extraordinary difficulties, he learnt English and French so well as to be able to write grammars in both languages, and developed a literary style as natural as Defoe's, as vigorous as Swift's, brightened by humour and telling invective, and perhaps as characteristically Anglo-Saxon as any that could be named.

Cobbett's English Grammar and French Grammar are written in the form of letters to his son, and are unsurpassed in the lucidity of their arrangement and their quality of genuine liveliness His *Weekly Political Register*, started in 1802, was continued, apart from one small break, until his death. In 1803 he began the *Parliamentary Debates* whence developed the present "Hansard" He wrote a *History of the Reformation*, which is still read, though chiefly by Roman Catholics. His *Advice to Young Men* is full of practical common sense for men and women Its vigour and frankness are as refreshing as the breath of the sea.

His best work is to be found in the picturesque accounts of his political tours on horseback, entitled *Rural Rides*. Cobbett is not a great literary character, but his style is the best of models for all who aspire to write clearly and correctly.

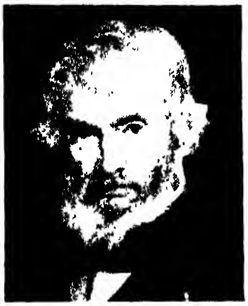
The prose masterpiece of **Walter Savage Landor** (1775 1864) is his *Imaginary Conversations*, 125 in number. Full of fine thought expressed in a highly finished, eloquent style, felicitous in imagery and diction, and bearing a clear impress of cultivated taste, they range over a vast area of topics, discussing questions of statesmanship, philosophy, poetry, literature, and manners, and reveal strong dramatic qualities which have caused many to wonder why their author failed to write a great play Among the dialogues specially admired for their dramatic intensity are those between Peter the Great and Alexis and between Henry VIII and Anne Boleyn. As an aid to the study of the life of Shakespeare, Landor's *Citation of William Shakespeare* can be enjoyed as a charming piece of imaginative prose

Another essayist of considerable charm and versatility is **James Leigh Hunt** (1784 1859), whose friendships secure for him a greater meed of recognition than his writings, though these are not unimportant. He introduced Shelley and Keats to each other, and brought these

poets before the public in *The Examiner*, of which he was editor and part proprietor. The student of literature will find much profit in his *Imagination and Fancy*, *Wit and Humour*, and *Men, Women and Books*, while his Autobiography contains enough to secure for it the permanent interest of all bookmen. London found in him an energetic champion, and his gossipy volume entitled *The Town: Its Memorable Characters and Events* retains some popularity. His notes on the Restoration dramatists inspired one of Macaulay's essays.

LESSON 34

A Survey of 19th-century Prose—II


Thomas Carlyle


Lord Macaulay


John Stuart Mill


J. A. Froude

The literary career of **Thomas Carlyle** (1795-1881), the great Scots writer, one of the most forceful moulders of 19th-century thought, began with contributions to *The Edinburgh Encyclopaedia* in the early 1820s. It was with his *Sartor Resartus*, published as a book in 1838, that he first adopted the highly individual style that came to be called "Carlylese"—electrical, explosive, sometimes heavily involved in its forms, yet always with the power of tremendous impact on the reader's mind. Of no great writer could it be averred more cogently that "the style is the man."

Carlyle's greatest works are those in history, sociology, and politics. But there is a great deal in his miscellaneous essays—those on Burns, Johnson, Scott, Voltaire, Diderot, and Mirabeau, for example—that must not be overlooked by any reader who desires to understand the man himself. Carlyle has been much misunderstood; but his influence has been almost incalculable in Germany as well as in England. He was "human, like ourselves"; perhaps more of an iconoclast and a prophet than a constructive power; but he looked to the "foundations of society," he had a genuine love of truth, and his striving after truth has left to posterity a standard of thought which must remain a permanent social as well as literary force.

Appreciations—and depreciations—of his labours there are in abundance, but perhaps Walt Whitman touched the reality:

> As a representative author, a literary figure, no man else will bequeath to the future more significant hints of our stormy era, its fierce paradoxes, its din, and its struggling periods than Carlyle. He belongs to our own branch of the stock, too; neither Latin nor Greek, but altogether Gothic. Rugged, mountainous, volcanic, he was himself more a French Revolution than any of his volumes . . . As launching into the self-complacent atmosphere of our days a rasping, questioning, dislocating agitation and shock, is Carlyle's final value.

It is impossible in a few words to formulate any plan for the special study of Carlyle's works. The general reader will take to such books as his fancy prompts, the student to those his studies suggest, and both may be left safely to come under the all-compelling influence of this virile and original thinker. The general reader should at least be acquainted with *The French Revolution*, *Sartor Resartus*, *Heroes and Hero Worship*, and *The Life of John Sterling*. If one begins with *Heroes and Hero Worship*, the appetite is more likely to be whetted than by entering the Carlyle treasure-house through the gate of *The French Revolution*.

Carlyle's greatest contemporary as an essayist and historian was **Lord Macaulay,** Thomas Babington Macaulay (1800-59). Unlike Carlyle, Macaulay did not confine his labours to the desk. He was a public official and a member of parliament as well as a man of letters. He became famous at the age of 25 as the writer of an essay on Milton in *The Edinburgh Review*. In this periodical all his best-known essays appeared, apart from a few biographies contributed to *The Encyclopaedia Britannica*. The essays are rich in applied

knowledge, drawn from the exceptionally retentive memory of an omnivorous reader. The judgments they contain, where these are not affected by the author's Whig sympathies, are usually sound. For a parallel to their diversity of subject-matter we must go to Landor's *Conversations*.

Macaulay was essentially a popular writer, one whose purpose was to think for his reader and to leave nothing to chance. Whole generations may be said to have been nurtured on his writings. His influence will always be considerable both as a stylist and as an historian, though he needs careful editing.

His great quality is clearness of diction, which he shares with Cobbett. The chief quality of his art is detail-decorated abbreviation ; but his use of a succession of short sentences, agreeable enough to the eye, is not invariably acceptable to the ear. His use of the device of antithesis has been responsible for much ineffective imitation. He remains a brilliant writer ; but, being brilliant, is hard. What he gains in glitter he misses in emotion. He does not delve deeply into the heart of things ; but without his aid many men and women of average insight and ability would never have been able to see so far or so well as they have seen. In the realm of prose his relation to Carlyle is that of Tennyson to Browning in the realm of poetry, although Macaulay in his clear brilliance may be better compared with Pope.

One of Macaulay's favourite catch-phrases for presenting an argument is a somewhat scathing comment "as every schoolboy knows." Certainly one fact known to every schoolboy for some generations past is that Macaulay was something of a poet, or, to say the least, a versifier, and that his *Lays of Ancient Rome* are particularly renowned for the stirring "Lay of Horatius."

Among the greatest of Carlyle's contemporaries was **John Stuart Mill** (1806-73), the philosopher whose *System of Logic*, *Principles of Political Economy*, *On Liberty*, and *Subjection of Women* will not be read for any literary graces if they do not attract the student in search of profitable mental exercise. It would be difficult to overestimate the influence of the "Saint of Rationalism" (Gladstone's apt phrase) on contemporary thought in politics, logic, and ethics.

The name of **James Anthony Froude** (1818–94) has been the centre of a whirlwind of controversy, which relates to literary history rather than to the study of literature. The friend of Carlyle, whose literary executor he was, Froude has much of Carlyle's sincerity. He stands with the prose masters of the century, his thought often soaring to heights of true eloquence. But he rivalled Macaulay in partisanship when he wrote history, which was the main concern of his literary life. Froude's contentious character colours all he wrote, yet his *Nemesis of Faith*, in which he reveals with deep sincerity his religious doubts, and *Oceana*—a delightful account of a voyage to Australia—are fascinating books, and his *Short Studies on Great Subjects* constitute one of the most brilliant and engaging series of essays and papers that ever emanated from one hand.

John Ruskin (1819-1900), like Carlyle, was a great social force as well as a greater writer. He was the most influential art critic of the century. His authority, like that of many other eminent Victorians, suffered diminution during the early years of this century, though even those who could no longer accept his pronouncements about painting, sculpture, and architecture were ready to admit the power and beauty of his prose style. To-day that prose style itself is often condemned as laboured, rhetorical, florid, while his high ideals and his humourless air of moral earnestness repel many who seek to read him ; but his ideas about art are once more being quoted as essentially in accordance with the deepest thought of the present age.

This indefatigable preacher and teacher imparted an incalculable impetus to the raising of the standard of labour. Whatever nature of labour it may be, it can hardly be regarded without some respect by anyone who has come under the influence of Ruskin's teaching. Like Carlyle, and to a lesser degree Froude, Ruskin gloried in the power of imparting and inspiring enthusiasm. He sought after the truth with all the ardour of Carlyle, and the student of his works will witness how time after time he was compelled by his own discoveries to relinquish positions he had at one time thought unassailable. His was the scientific spirit of inquiry—he regarded even his drawings rather as of scientific than of artistic importance.

Ruskin was the embodiment of the spirit of reverence, and a high priest of the temple of beauty. He opened many eyes to the infinite variety and charm of external nature. The clouds seem to have acquired a different meaning since Ruskin wrote about them. His style is impregnated with the influence of Bible study, an influence which, however, can be realized only by those whose knowledge of the Bible corresponds in some measure to Ruskin's own intimate grasp of it. Almost everything he wrote is worth reading, from *The Seven Lamps of Architecture* to *Fors Clavigera*.

Matthew Arnold (1822-88), whose work as a poet has already been discussed (*see* Lesson 22), combined social with literary criticism. He foretold the fall of the aristocracy, and distrusted

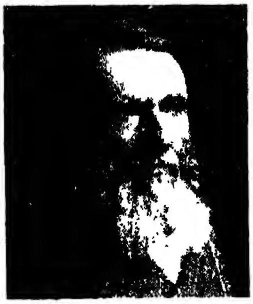
the middle classes. Much that has been written and said concerning his "contempt for unintellectual people" is unjustified, and caused him no small amount of disquiet, as his letters testify—especially the epistle written to his mother in 1868. As a writer, he had much in common with Sainte-Beuve, perhaps the greatest literary critic of the 19th century, his standpoint in regard to art and letters being in many respects more French than English. First and foremost he was a scholar, and valued scholarship highly. *His Essays in Criticism, Culture and Anarchy, Literature and Dogma*, and an earlier work, *On Translating Homer*, are his most widely read books.

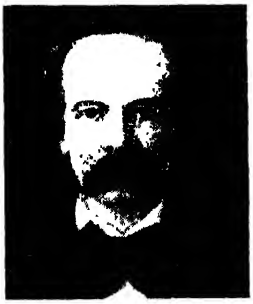
A particularly sensitive critic of literature—especially poetry—and one of the most potent critical forces of the last century, was **Theodore Watts-Dunton** (1832–1914). His *Studies of Shakespeare* and *The Renascence of Wonder* are notable works, and he also wrote shrewd biographical criticism for *The Encyclopaedia Britannica*. For some forty years he was the close friend and companion of **Algernon Charles Swinburne** (1837–1909), whose poetry has already received attention. As a critic Swinburne had faults of over-statement and passionate praise, which anyone would expect who first met him as a poet. His prose was the fine, vibrant prose of a poet, and his biographical and critical studies, ranging from the Elizabethans to the Victorians, offer unusual opportunities for the awakening of enthusiasms. If the reader is careful not to place himself too completely at the critic's disposition, he will have considerable increase of literary understanding.

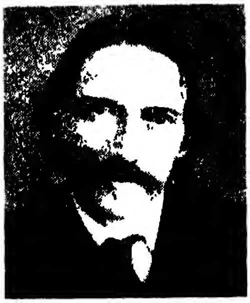
Eminent among the other critics who lent distinction to English letters in the latter part of the 19th century was **Walter Horatio Pater** (1839–94), whose exclusiveness was akin to that which so long kept Matthew Arnold aloof from the average reader, and whose *Sketches in the History of the Renaissance, Imaginary Portraits*, and *Appreciations* are marked by an exotic beauty of style, refinement of taste, breadth of culture, and keenness of insight. The particular views on art and life propounded and developed by Walter Pater need not be considered here, but must be taken into account in any permanent evaluation of his work as a writer. The same can be said in regard to the writings of another hedonist, **John Addington Symonds** (1840–93), who also helped to bring the bright side of the Renaissance, as well as that of Elizabethan England, before English readers. The splendid selfishness of these writers, however, cannot compensate for all the problems they left untouched. To them, engrossed in their introspection, it mattered not that the times were out of joint—as the times of their aesthetic movement undoubtedly were.

Nevertheless the critical essays of **Oscar Wilde** (1856–1900), the culminating figure of that movement, for all their elaborate and self-conscious exquisiteness, have a wit that gives them savour. Books like *Intentions* and *The Critic as Artist* may strike a reader to-day as little more than posturing; but at least the posture is an entertaining one, and the reader is fully aware that the author knows it. Argument by paradox and epigram, as re-introduced into English literature by Wilde and developed by Chesterton and Shaw, is not necessarily a thing to be lightly dismissed.

Above all others the name of **Robert Louis Stevenson** (1850–94) illuminates the record of prose writing in the closing two decades of the 19th century, and that because Stevenson was the true herald of a return to literary style in an age when slovenliness or all that is commonplace and pedestrian was becoming common. Stevenson realized with Lowell that the true preservative of literature is style. He never wrote a careless or ill-considered phrase. Thus *Kidnapped* and *Treasure Island*, though originally written for a boys' paper, in which disregard of literary grace might have been excused as long as due respect was paid to the laws of grammar, were nevertheless written


John Ruskin


Theodore Watts-Dunton


R. L. Stevenson


Richard Jefferies

with sensitive feeling for the rhythm of prose, with all that savour for the right and just word which marked his finest work.

Stevenson has been described as "the happiest master of vagabond discourse in the whole of the 19th century." He began as an essayist, and his chief prose works, apart from fiction, are *An Inland Voyage*, *Travels with a Donkey in the Cevennes*, *Virginibus Puerisque*, *Familiar Studies of Men and Books*, *Memories and Portraits*, and *Across the Plains*. He won fame as a writer of romance, and then in his intimate prose essays proceeded to reveal to the world one of the most charming personalities in the whole long story of English literature.

Stevenson resembles Charles Lamb in that his discursive essays resemble the best sort of conversation. They may be monologues, but they never bore; indeed, so aware of the reader, so considerate towards him, is the writer that the reader experiences the illusion of having taken a full part in the conversation: and certainly he feels himself in the presence of a delightful companion.

A similar "conversationalist" whose companionship is almost equally rewarding is **Richard Jefferies** (1848–87). He lived for thirty of his thirty-nine years before he attained real success, with his book *The Gamekeeper at Home*. But his few remaining years, three or four of them endured in pain and hardship, were sufficient to leave to posterity a whole shelf of volumes—novels, descriptive essays, autobiography.

The reader of Jefferies will find that his native tongue can be written with a joyous expressiveness that seems on analysis to be so simple as to be almost effortless; but writers know how often the greatest pains have been exerted where there is least evidence of any. Hard writing, they say, makes easy reading. Jefferies was a conscious artist in words, just as he was a conscious philosopher in his reading of earth's secrets. His acquaintance with the teeming life of the hedgerows was accurate, not sentimental; penetrative, not superficial. *The Story of My Heart* is among the most engrossing books of confession in the language.

This survey cannot in the space allotted do more than indicate some of the other outstanding prose works of the 19th century; the massive biographies, such as those of ROBERT SOUTHEY (Nelson, John Wesley), JOHN GIBSON LOCKHART (Scott, Burns, Napoleon Bonaparte), CARLYLE (Cromwell, Frederick the Great), JOHN FORSTER (Goldsmith, Dickens), DAVID MASSON (Milton), GEORGE HENRY LEWES (Goethe), and SIR GEORGE TREVELYAN (Macaulay); the historical studies of Macaulay, Froude, HENRY HALLAM (*View of the State of Europe during the Middle Ages* and *Constitutional History of England*), HENRY THOMAS BUCKLE (*Introduction to the History of Civilization in England*), WILLIAM EDWARD LECKY (*History of Ireland*, etc.), EDWARD AUGUSTUS FREEMAN (*History of the Norman Conquest*), and JOHN RICHARD GREEN (*A Short History of the English People*), most of them now outmoded as history, but all examples of a mode of recording history of which the influence was world wide; the two epoch-making books by CHARLES DARWIN, *The Origin of Species* and *The Descent of Man*, extraordinarily lucid in their presentation of the revolutionary theory of natural selection; WALTER BAGEHOT'S authoritative work on *The English Constitution*; JOHN HENRY NEWMAN'S *Apologia pro Vita Sua*, and FREDERIC DENISON MAURICE'S *The Kingdom of God*, and such individual achievements, defying classification, as *Eothen*, a travel book about the East, by ALEXANDER WILLIAM KINGLAKE (who also wrote the standard history of the Crimean War), GEORGE BORROW'S *The Bible in Spain* (other works by Borrow are classed among the novels in a later Course), and Thackeray's lectures on *English Humorists of the Eighteenth Century* and *The Four Georges*, and his *Book of Snobs*.

One or two other 19th-century works are left for mention until the next Lesson because they are from the pens of those who lived and worked well into the 20th century and whose writing is best assessed from the standpoint of that century.

Mention has already been made of the place of the periodical Press in the development of English prose. The most influential of these near the beginning of the century were three famous literary reviews, *The Edinburgh Review* (founded 1802), *The Quarterly Review* (1809), and *Blackwood's Magazine* (1817). Later came *The Fortnightly Review* (1865), *The Contemporary Review* (1866), and *The Nineteenth Century* (1877). During the last decade of the century a weekly journal, *The Saturday Review* (founded 1855), under brilliant editorship, became the most fertile of breeding grounds for a later generation of famous writers, including Bernard Shaw and Max Beerbohm, both of whom served a literary apprenticeship as its drama critics.

LESSON 35

Prose Writers of the 20th Century

As this rapid survey of English prose writing, apart from fiction and drama, approaches the present day it becomes an increasingly difficult problem to sift from the mass of printed words that has been so characteristic a feature of the century—a century in which for the first time nearly all men and women can and do read —and from the countless writers who have achieved some meed of contemporary public recognition, those writers who may prove in the future to have produced lasting literature, or contributed something permanent to the story of English prose. Which among them will bear comparison with those great writers whom these Lessons have already presented for the student's attention? They are too close for final appraisal One can do little more than indicate the more obvious probabilities. For the rest, the wise reader will, as he reads, no doubt school himself to recognize whatever writing is consonant with the finest traditions of English prose, and to discriminate clearly between that kind of writing and the sort that is, however meritorious in other respects, as ephemeral as a firework.

Each year sees the publication in the United Kingdom of some 13,000 new books of every conceivable kind, and even if a small proportion of these can claim to be good literature, it is obvious that our story will have to end : " To be continued."

Demands of Journalism

It has already been indicated that periodical journalism served to divert the great 18th-century talent for letter-writing (a talent now for the most part utterly neglected) from private into public channels. But later changes in newspapers and magazines themselves have further modified both the style and the point of view of much English writing. Broadly speaking, the " essay " has become the " article," and the article has usually a character that is alien to the essay proper. In other words, the article is the answer to popular demand for concise information or guidance on subjects that most people have had no special opportunity to study deeply.

With the widespread development of education the specialised power of the pen passed from the hands of an exclusive " literary " class. Moreover those who write for their livelihood to-day must address themselves to the interpretation and solution of what are called " questions of the day," because it is " journalistic " interest which rules. Their subjects are no doubt often literary in a sense ; but the writer who now secures any considerable hold upon the public has been compelled to recognize that life is greater than literature. The larger public demands lucidity in exposition before the display of literary airs and graces ; and this is not necessarily a bad thing.

Indeed, one of the most famous and prolific of 20th-century writers openly avowed that to be thought of as a journalist was to him preferable to being thought of as an artist, and that he had no illusions about the probable fate of the bulk of his output, even of his many novels. This was **Herbert George Wells** (1866–1946).

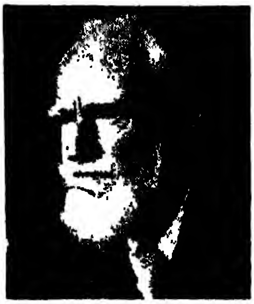
Wells might be taken as the prototype of that new class of writer which began to emerge towards the close of the 19th century from a lower grade of the social scale than had up to then been usual. His father was a professional cricketer, his mother had been in service before her marriage and returned thereto as a widow. Wells himself was successively chemist's apprentice, draper's assistant, and pupil teacher before becoming a student of science at South Kensington. He gained a London University science degree, then taught for a time at a private school, and his first published work was a text-book on biology.

Over a period of fifty years he published over eighty books. His work as a novelist will be considered in a later Lesson, but it is to the point here to say he used the form of the novel ever increasingly as little more than a means of impressing on the world his particular ideas about life and the way it could be lived. His non-fictional work was directed to the same end. Though he was ready to write about anything and everything, he directed his subjects always in accordance with his one constant theme—the possibility of a happier and saner social order ; while his one constant purpose in writing was to stimulate and re-direct human thought towards such an order. He was gifted with remarkable vision, one that could see the whole universe as a single unit ; so that often, as we read, it seems that he surveys the world from some vantage-point outside time and space.

This gift brought with it a facility for accurate prophecy ; for example, he wrote a book, *The World Set Free*, about the explosion of atomic bombs, as early as 1914. He was always looking ahead of his time, and (until near the very end of his life, when he was at last losing a life-long battle with ill-health) always optimistically and enthusiastically ; and so lucidly were his ideas expressed, with so vivid and amusing a turn of phrase and such a display of intellectual vitality,

H. G. Wells

Arnold Bennett



Bernard Shaw

Hilaire Belloc

that he was able to make his many readers "think forward" with him. In other words, his prose was admirably suited to his purpose, which was to be a stimulating teacher and preacher.

The influence of his writing on 20th-century thought is immeasurable. Its influence upon the development of English literature, except perhaps on that of the novel, is negligible. Because on his own admission he wrote as a journalist—publicist is perhaps a better word—most of his books, however entertainingly written, were already dead in his own lifetime. Yet their very titles afford a good notion of his scope and his persistent purpose: *Anticipations, Mankind in the Making, A Modern Utopia, New Worlds for Old, An Englishman Looks at the World, The Salvaging of Civilization, The Way the World is Going, The Work, Wealth, and Happiness of Mankind.*

His *Outline of History*, however, is in a class by itself as a bold and original attempt to present the whole human story from its earliest beginnings as a consecutive and harmonious whole. The book is coloured to some extent by Wells's prejudices—for example, he takes mischievous delight in making Napoleon play a very small, insignificant part—and he obviously intended to make all the recorded past the servant of his own view of the future; but it was a new view of history, brilliantly presented and expounded, a *tour-de-force* of self-expression. Finally, his autobiography may well become one of the classics of that difficult art.

Wells's contemporary and friend **Arnold Bennett** (1867-1931) is an outstanding example of a man who went into the writing business in the same spirit as others go into stockbroking, engineering, or the brewing trade. His social origins, like those of Wells, were relatively humble. After a secondary school education, he became a solicitor's clerk in the Potteries. He set himself to write, and to make money by writing. This ambition he achieved. He was sufficient of an artist to school himself to write well, and was disdainful of all slovenliness of diction in other writers. So conscientious was he in this matter that it seems a pity that except for one or two novels (to be considered in a later Lesson) his cultivated elegance of style and his keen appreciation of word values were mostly squandered on mere "pot-boiling."

Bennett was certainly a noteworthy product of the changes in fashion by which the essay has become the article and the prose writer finds in the columns of the newspaper the opportunity to address audiences incalculably larger than he could ever hope to reach through the medium of the bound book. Arnold Bennett was a "publicist" *par excellence*. His weekly review of books in a London evening newspaper had an astonishing influence on the reading public, an influence unequalled by any of his contemporaries. His oracular judgments could establish the fame of an unknown writer overnight.

The third big figure to dominate the thoughts of the public, no less as a "publicist" than as a dramatist, was **George Bernard Shaw** (1856–1950). He was primarily a playwright, and his plays are considered in a later Lesson. Shaw, again, was no product of the universities. He was the son of a retired Irish civil servant, and learnt little at the various schools he attended in Dublin. He left school at the age of fifteen to work as a clerk in a land agent's office. Five years later he went to London, where (as he admitted quite shamelessly) he lived for ten years on his mother, who taught singing while he improved his education in the reading-room of the British Museum. He began his literary career as music critic for a newspaper, then as drama critic for *The Saturday Review*.

He wrote a number of political pamphlets, long forgotten; innumerable long letters to the newspapers; and in later life a lengthy volume with the self-explanatory title *The Intelligent Woman's Guide to Socialism*. He was a supreme master of the art of self-advertisement, his usual device being to utter startling, scathing, and deliberately perverse pronouncements on every subject that came his way, always doing it

in the name of what he called " common sense." It made his fortune.

Shaw's finest contribution to English prose is encountered by those who read the long prefaces he wrote for the printed editions of his plays. No other prefaces like these have ever been written. Often enough they have only the flimsiest connexion with the play they purport to introduce, but are veritable essays, expressions of a highly individual and lively point of view, provocative, closely argued and brilliantly written. They are alive with wit and paradox. But more than that, as the argument develops, the sentences seem to acquire a rhythm that is not the rhythm of verse, but essentially the rhythm of great prose, with its own rise and fall, its own light and shade, its own cadences and contrasts, its own feeling of rightness and " inevitability ". These prefaces will repay close study as a superb example of the wedding of manner to matter. They echo the rhythm that is to be discerned in the plays ; but many readers prefer the prefaces, and it is true that they profoundly affected the thought of the period just as much as the plays did.

Another journalist, but one more in tune with the older tradition of literature, was **Gilbert Keith Chesterton** (1874–1936), whose work as a poet was mentioned in Lesson 24. His work as a critic and miscellaneous writer was invariably entertaining, and no man ever ventilated his opinions on social and religious matters with more engaging frankness. Like Wilde and Shaw, he made great play with paradox, though the reader may sometimes feel that Chesterton allows his joy in the device to lead him to conclusions that he had not intended. In their employment of paradox one might distinguish between the three men thus: Wilde says in effect, " It is a dreary world, let us ignore it and talk amusingly about art " ; Shaw says, " It is a mad world ; let us stand on our heads to acquire a sane view of it " ; Chesterton says, " It is a riotously funny world ; let us revel in it while we prepare for the next." One may read Chesterton's study of *Charles Dickens* or his *Victorian Age in Literature* and learn far less about these well-worn subjects than about the stimulating personality of Chesterton himself ; while such collections of essays as *All Things Considered* and *Tremendous Trifles* are unfailing sources of surprise and delight.

Chesterton's friend and sometime collaborator, **Hilaire Belloc** (1870–1954), whose poetry is also separately appreciated in Lesson 24, was one of the most accomplished and versatile of English writers. A journalist and vigorous controversialist and something of a military critic, he was also a brilliant biographer, a learned exponent of French history, a student of politics—one of the few, in fact, who maintained in an age of specialisation the larger tradition of the finest periods of literature by displaying confident power in many branches of the art. As historian he identified himself intimately with the period on which he happened to be writing. A " traveller in time," he returned in creative imagination to an age that is gone. But, first and last, he was an essayist, of light, gracefully expressive touch, with an air of courtliness, and a gift of humour at once urbane and hearty. *The Path to Rome* is one of his most characteristic books.

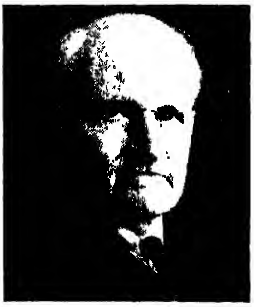
As historians of England both Chesterton and Belloc affirm the view that the Reformation was a criminal blunder in that it destroyed the golden medieval age of faith ; both men were engaged on controversies that centred on their joyous advocacy of Roman Catholicism.

Another feature of modern periodical journalism, the regularly contributed *causerie* or light commentary on human affairs, has often provided an opening for the kind of writer who in early days might have found his true *métier* in the formal essay. Thackeray set the style in the previous century with his Roundabout Papers in the *Cornhill* magazine. Towards the end of the century " Q," otherwise **Sir Arthur Quiller-Couch** (1863–1944), was excelling in the same *genre*, with a touch both light and

Augustine Birrell

John Morley

Sir Winston Churchill



G. M. Trevelyan

scholarly. **Sir William Robertson Nicoll** (1851–1923) and **Clement K. Shorter** (1857–1926) were distinguished men of letters whose weekly commentaries, the one in *The British Weekly* (under the pseudonym of "Claudius Clear"), the other in *The Sphere*, were more often concerned with literature than with life, and the supple prose of both was not without influence in the literary work of their day. The tradition was upheld by such writers as **Edward Verrall Lucas** (1868–1938) in *The Sunday Times*; **Robert Lynd** (1879–1949), in *The New Statesman*, *News Chronicle*, and *John o' London's Weekly*; **Sir Harold Nicolson** (b. 1886) in *The Spectator*, and **Sir Arthur Bryant** (b. 1889) in *The Illustrated London News*. Indeed some of the most pleasing and exemplary prose of the century is to be found in such causeries. Loosely in the same category, though their more specialised style and limited range of reference are not directly to every taste, are the anonymous "fourth leaders" of *The Times*.

It should be emphasised that all the writers named in the foregoing paragraph were much more than periodical "columnists". "Q" published much fiction, and as King Edward VII Professor of English Literature at Cambridge delivered the lectures which, when issued in book form, had immeasurable influence, *On the Art of Writing* and *On the Art of Reading*. Other series of his lectures were also published as volumes *Studies in Literature*, *Charles Dickens and Other Victorians*, and *Shakespeare's Workmanship* while his editorship of *The Oxford Book of English Verse*, as well as *The Oxford Book of English Prose*, deservedly two of the most popular of all anthologies, gave further evidence of his scholarly discrimination. Robertson Nicoll was founder-editor of *The Bookman*, and published many works on literature and theology. Shorter won distinction as an authority on the Brontes, Borrow, and Napoleon, and published a masterly little *Handbook to Victorian Literature*. Lucas wrote regularly for *Punch*, published several light novels and a series of travel books, and edited anthologies and the letters of Charles Lamb, of whom he was a professed disciple. Lynd was for many years literary editor of the *News Chronicle*, and published several volumes of essays and a book about Dr. Johnson. Nicolson is a skilled biographer and historian. Bryant's finest achievements were his biographies of Charles II and Samuel Pepys and a series of vivid historical studies dealing with the period of the Napoleonic Wars.

Among the outstanding essayists must also be named **Augustine Birrell** (1850–1933), author of the elegant *Obiter Dicta*; **Alice Meynell** (1850–1922), graceful in diction, clear in wisdom, and profoundly meditative; **Arthur Christopher Benson** (1862–1925), mellow and cultured, who in *The Upton Letters*, *From a College Window*, *The Thread of Gold*, and other volumes, almost succeeded for a time in giving the essay a popularity rivalling that of the successful novel; **Charles Edward Montague** (1867–1928), a professional journalist and a conscientious and sensitive stylist, whose slim book of essays entitled *The Right Place* deservedly stands beside his three fine novels and his *Disenchantment*, one of the earliest books to reveal something of the inner truth about the First World War; **John Boynton Priestley** (b. 1894), whose versatility is by no means confined to the writing of novels and plays, but extends to books descriptive of travel and containing passages of deep personal reminiscence, and who has also perfected—one might almost say invented—the art of the broadcast essay or causerie; **George Orwell** (Eric Blair, 1903–1950), whose shrewd, original mind sought new subjects; and, not least, **Sir Max Beerbohm** (1872–1956), whimsical, gently satirical, and an exquisite artist in the use of words and the construction of phrases.

The more scholarly writers of criticism, in addition to Sir Arthur Quiller-Couch, already noted, include **George Edward Saintsbury** (1845–1933), who possessed an encyclopedic knowledge of both English and French literature, a finely impartial mind, and a forceful, if somewhat rugged, prose style. His *History of Criticism*, in three volumes, is his outstanding work. He was Professor of Rhetoric and English Literature at Edinburgh from 1895 to 1915. **Sir Walter Raleigh** (1861–1922) was Professor of English Literature, first at Glasgow, then at Oxford. He produced important literary criticism in his monographs on *The English Novel* and *Style* and in his studies of Milton, Wordsworth, and Shakespeare. In **Sir Edmund Gosse** (1849–1928) urbanity and literary scholarship were happily combined. Although he wrote much, he seldom wrote hastily; his judgments are usually convincing, and his work should be assured of permanence. His *Father and Son*, originally published anonymously, is a dignified exercise in the intimacies of biography and autobiography.

Mention should also be made of four scholarly specialists in the study of Shakespeare: **Edward Dowden** (1843–1913), **Andrew Cecil Bradley** (1851–1935), **John Dover Wilson** (b. 1881), and **George Bagshawe Harrison** (b. 1894).

Among historians and biographers of the 20th century a special and prominent place must be given to **Sir Winston Churchill** (b. 1874). His biography of his father, Lord Randolph Churchill, published in 1906, is a full-scale study of the first quality, and the same tribute can be paid with even greater justice to the


George Saintsbury


Sir Walter Raleigh


Sir Edmund Gosse


Sir Arthur Quiller-Couch

biography of his illustrious ancestor, the 1st Duke of Marlborough. His most important contributions to historical writing, of course, are *The World Crisis*, a monumental work on the First World War, and the six volumes of *The Second World War*, his own detailed personal account of the years in which he, by his leadership, himself helped so magnificently to sway the whole course of world history. The latter work, by reason of his own dominant relationship to the mighty events that he records, is without parallel in the world's literature. Truly, as one critic observed, it is "as though the *Iliad* had been written by Agamemnon." This of itself might not serve to win it a high place in literature; but the fact is, it *is* literature of no mean order, and this differentiates it sharply from such a work as the *War Memoirs* of David Lloyd George. Churchill is a master of the compelling (and often unexpected) word, of the vital, illuminating phrase, of the significant, dramatic climax. The only fault that might be found with his prose is perhaps an undue relish for the rolling cadences of the orator—and even they will long help, along with his published collections of speeches, to preserve the echo of Churchill's superb oratory.

George Macaulay Trevelyan (b. 1876) compiled a short *History of England* and a *Social History of England* that have become generally accepted in their own time as standard works, and are enjoyed by many who have no particular taste for history, very much as they would enjoy a fascinating novel, so skilfully is scholarship blended with lucidity. The historical studies of Sir Arthur Bryant have already been noted, and another attractive historian (or, more accurately, historical essayist) is **Alfred Leslie Rowse** (b. 1903), whose bitter, if honest, autobiography, *A Cornish Childhood*, also deserves notice.

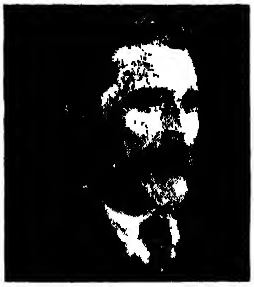
John Morley (Viscount Morley: 1838–1923), journalist, editor, critic, scholar, and statesman, published his monumental *Life of Gladstone* in 1903. It was one of the last great biographies written in the 19th-century tradition of respectful adulation. **Lytton Strachey** (1880–1932) gave the art of biography a "new look" with his *Eminent Victorians* and *Queen Victoria*, published respectively in 1918 and 1921. This was biography with a bite of satire and more than a suspicion of malicious wit; but it was also biography with an imaginative shape. It was as though for the first time in English literature a biographer had looked all round his subject coolly and dispassionately and then presented his portrait as a work of lively creative art. It so happened that Strachey selected as his subjects those which had been "immortalised" by the undue adulation of earlier "official" biographers. Re-presenting them as essentially human beings, Strachey mercilessly destroyed many a legend; and his success led to a fashion for "debunking" which, in the hands of less skilful writers, soon became nauseating. Nevertheless, this iconoclasm served its turn in establishing that a biography, even without undue denigration, could be made as entertaining and as fascinating as a novel; and it is a striking fact that the 20th century has seen a remarkable rise of popular interest in biographical literature, often at the expense of fiction. The development of the art is symbolised by the kind of titles that so many biographers have come to prefer—not *The Life of Cowper*, but *The Stricken Deer*; not *The Life of De Quincey*, but *A Flame in Sunlight*.

In view of the contemporary popularity of biography, it might be profitable to the student to read these words by a skilful contemporary practitioner of the art, Peter Quennell:

> There is reason to hope that . . . the habit of ruthlessly "debunking" a hero and the previous practice of smothering him from head to foot in heavy coats of whitewash are now equally out of favour with the intelligent reading public. It is obvious that a biographer must be candid. The time has gone by when, because a fact is unpalatable, it seems necessarily inacceptable; when a biographer feels justified in censoring his documents, running two documents into one, or completely suppressing a paragraph that does not suit his thesis. His aim is—or should be—to tell the whole truth about a man in so far as it is relevant

Sir James Frazer

Lytton Strachey



W. H. Hudson

Lord David Cecil

to the general pattern of his character, to portray that character in its entirety; to draw a portrait in which light and shade are fairly and accurately balanced. . . . A biographer may use his imagination when he interprets motives, but we must be quite sure where the conjectural begins and the factual ends.

Notable 20th-century biographers, other than those already mentioned, include Philip Guedalla (Palmerston, Wellington), Lord David Cecil (Cowper, Melbourne), Edith Sitwell (Pope), and Sacheverell Sitwell (Mozart), while various volumes by Sir Osbert Sitwell serve to place him among the foremost of practitioners in the art of autobiography.

There remain various outstanding books and writers which defy strict classification: works of popular elucidation on difficult subjects such as *The Mysterious Universe*, by Sir James Jeans, a model of its kind; Lancelot Hogben's *Mathematics for the Million*; the expositions of philosophy by C. E. M. Joad, and of biology by Julian Huxley. All these would be less illuminating to the layman than they are were it not for the writers' skilful and fluent use of good prose. To these may be added the brightly argued theological expositions of C. S. Lewis (b. 1898). **Havelock Ellis** (1859-1939) gathered a large audience for his studies in psychology and philosophy, and **Bertrand Russell** (b. 1872) holds an honoured place among mathematicians and philosophers and provides wide interest by his keenly intellectual lucubrations on a variety of scientific, philosophic, ethical, economic, and social problems.

Although the first volume of *The Golden Bough*, by **Sir James George Frazer** (1854 1941), appeared in 1890, the full version in eleven volumes of this monumental and encyclopedic study in comparative religion, mythology, and folk lore, is a product of the 20th century. No such book had previously existed, and its influence on contemporary thought is incalculable.

The writer on nature, **William Henry Hudson** (1841 1922), is among the masters of a prose that is schooled to simplicity and has rare and tenuous charm *The Naturalist in La Plata*, *Far Away and Long Ago*, and *A Shepherd's Life*, could be singled out from his many books for particular commendation, and *The Purple Land* and *Green Mansions*, though classed as fiction, are more notable for their fine descriptive prose than for their stories.

For so long as **Thomas Edward Lawrence** (1888 1935) continues to awaken interest, people will find in *The Seven Pillars of Wisdom*, and perhaps even more readily in the shorter version of the same book published as *Revolt in the Desert*, a stimulating literary quality that faithfully reflects one aspect of the problematical personality of the writer.

Honourable mention of the vivid travel books of H. M. Tomlinson and of two charmingly sincere autobiographies by Siegfried Sassoon, *Memoirs of a Fox-hunting Man* and *Memoirs of an Infantry Officer*, bring our survey to a close.

LESSON 36

English Drama: 17th and 18th Centuries

Our story of English dramatic literature was interrupted at the end of Lesson 16 so that we might complete the story of poetry, with which up to that point the drama had been closely identified, but from which, after the 17th century, it became increasingly divorced. We may now conveniently bring the story up to date. It will not occupy much space; for, truth to tell, by comparison with its great effulgence in the Elizabethan age, the light of English drama waxed dim for two hundred years, and the story is one of long decline. There were always plenty of theatrical craftsmen, but the taste of the playgoer declined

until he was content, as often as not, to accept mere bawdry for his comedy, and for his tragedy a theatrical convention that was no more than a ghastly travesty of real life, reaching its nadir in the blood-tub of Victorian melodrama.

Such a generation could pay lip service to the memory of Shakespeare but could not appreciate his plays in the theatre until they had been adapted and altered by lesser men to consort with the coarser tastes of the time. Thus Nahum Tate's version of *King Lear*, in which Cordelia lives to marry Edgar, and Colley Cibber's grossly underscored version of *King Richard the Second* lingered on half-way through the 19th century. These were the versions that Garrick and Kean acted, and that Dr. Johnson, who should have known better, was satisfied to hear, conscious no doubt of his own words (in the prologue he wrote for the re-opening of old Drury Lane theatre): "The Drama's laws the Drama's patrons give." The theatrical craftsmen, as they so often have done, set themselves to give the playgoing public exactly what it wanted, and no more.

To this day there exists a fairly clear distinction between the plays that can be accepted as good literature and those that are primarily what is called good "theatre." Many lovers of the theatre will rise to defend the latter kind and ask by what authority literature should extend its demands beyond the covers of a book. They may well be right. The dramatic critic makes himself alert to qualities and virtues and defects that are of no interest to the literary critic. But in this Course on English Literature we are looking only for literature—wherever it can be found; and anyway the argument may well be settled by the recent return to dramatic writing of many who possess *both* a sense of "theatre" and a sense of literary style.

Let us run over the brief list of those dramatists between the Elizabethans and Sheridan whose reputation has endured.

Sir William Davenant (1606–68) reflects in his dramatic work the spirit of reaction against Puritanism. His *Siege of Rhodes* is the germ of English opera, and he introduced many accessories to the theatre, among them the orchestra.

John Dryden (1631–1700), whose major achievement as a poet has already been considered, adapted the heroic couplet to drama. He concocted an absurd adaptation of *The Tempest*; but his *All for Love*, a version of the story of *Antony and Cleopatra*, has fine poetical merit, while such tragedies as *Don Sebastian* and *Cleomenes*, together with the comedies of *Marriage à la Mode* and *The Spanish Friar*, contain much that is eminently *readable*. His characters are mostly abstractions. He uses noble language to convey decidedly extravagant ideas. The student should not miss his interesting *Essay on Dramatic Poesy*.

Macaulay's collected essays include one on "The Comic Dramatists of the Restoration," originally written as a review of Leigh Hunt's edition of the works of Wycherley, Congreve, Vanbrugh, and Farquhar. The student who would make closer acquaintance with these dramatists cannot do better than read this brilliant disquisition.

William Wycherley (*c.* 1640–1716) was one of the two great lights of what is now called "Restoration comedy"—a characteristic of which was indecency, and in that particular Wycherley can rival any of his contemporaries. But he was one of the originators of the "comedy of manners," a faithful mirror of the fashions and foibles of his age. His best-known comedies to-day are *The Plain Dealer* and *The Country Wife*. The one is founded on Molière's *Le Misanthrope*, and was praised by Hazlitt as "a severe and poignant moral satire"; the other suffers, by comparison with its sources, Molière's *L'École des Maris* and *L'École des Femmes*.

With **William Congreve** (1670–1729) the comedy of manners reached its apogee. *The Old Bachelor*, *The Double Dealer*, *Love for Love* (which has been called the finest prose comedy in the language), and *The Way of the World* were all written before he was thirty years old. So was his dull and stilted tragedy, *The Mourning Bride*. It was the failure of *The Way of the World* to please its contemporary public that turned Congreve from writing. His later career shows him to have sacrificed his genius for the worship of rank. His social success was remarkable, and he amassed a large fortune.

Congreve was, and remains, a master of repartee and polished insolence in dialogue, and, in the prim words of Macaulay, "Congreve's offences against decorum, though highly culpable, were not so gross as those of Wycherley."

What **Sir John Vanbrugh** (1664–1726) lacked in grace he made up for in coarse wit and facile inventiveness. The epitaph written for him

> Lie heavy on him, Earth! for he
> Laid many heavy loads on thee

alludes to his achievements as the architect of Blenheim Palace and Castle Howard, not to his authorship of *The Relapse*, *The Provok'd Wife*, and *The Confederacy*.

George Farquhar (1678–1707) improved on his predecessors in cogency of construction, and his incidental verse indicates a power that was never fully cultivated. He wrote best what he wrote last: *The Recruiting Officer* and *The Beaux'*

William Wycherley

William Congreve

Sir John Vanbrugh

Richard Sheridan

Stratagem. He marks the transition from Restoration-period licence towards the more refined, if more conventional, stage fashion of the 18th century.

Thomas Otway (1652-85) is a strayed tragedian out of time, belonging by mood to the Elizabethans. He lived tragically, wrote tragedy, and died young. Gloomy as are his plays, and devoid of all lyrical beauty, they reach the heart by sheer force and knowledge of human nature. "More tears have been shed probably," wrote Scott, "for the sorrows of Belvidera (in *Venice Preserv'd*) and Monimia (in *The Orphan*) than for those of Juliet and Desdemona."

As for the comedies of **Sir George Etherege** (1634-91), **Thomas D'Urfey** (1653-1723), **Thomas Shadwell** (c. 1642-92), and the woman playwright and novelist **Aphra Behn** (1640-89), only the reader who cares to familiarise himself with the indifferent for the sake of the picture of contemporary manners to which it may give completeness need devote any attention to them.

In the bleak waste-land which symbolises English drama in the earlier half of the 18th century one can discern only two fertile spots. Yet it is doubtful if any English audience to-day would tolerate the arid accuracy of Addison's *Cato*, a tragedy in blank verse on the classical model, though it made a great hit in 1713. On the other hand, it is an instructive work to read, if only to discover how deficient could be the elegant scholarship of the 18th century in that elusive quality of genius and that manifestation of vitality which illumines not only Shakespeare's plays but also those of most of his contemporaries. By contrast, the astonishing career of *The Beggar's Opera*, first produced in 1728, eclipses everything else in the history of the English stage. That this prose farce, written by the poet **John Gay** (1685-1732) as a burlesque of the Italian opera, should not only have won immediate success with its witty dialogue and dainty lyrics set to popular airs of the day, but have been revived again and again, and from 1920 should have drawn London audiences for three and a half years to a suburban theatre, suggests that it is informed with a rare and highly individual charm.

Nevertheless the English playgoer of the days of Queen Anne and the early Georges favoured tragedy rather than comedy, and was not particular as to the quality of either. The picture remains gloomy until suddenly lit to brilliance by Goldsmith and Sheridan. The former has already been considered for his contribution to poetry and in a further lesson will take his due place in the story of the English novel. His comedy *She Stoops to Conquer*, produced in 1774, is one of the rare perennial flowers of the English stage, its wit always fresh and fragrant. It has been hailed as exhibiting "wit without licentiousness, humour without extravagance," and this was a phenomenon then virtually unexperienced for a century and a half.

Only a year later **Richard Brinsley Sheridan** (1751-1816) almost leapt to fame in a night with the production of an even richer comedy, *The Rivals*, and this was followed in 1777 by another of the supreme English comedies, *The School for Scandal*. A man of great and diverse gifts, who became a distinguished member of parliament and a magnificent orator, Sheridan as a dramatist has been surpassed in genuine humour only by Shakespeare—and possibly in characterisation too, for Mrs. Malaprop, Sir Anthony Absolute, Bob Acres, Sir Lucius O'Trigger, and Lydia Languish, all of *The Rivals*, and Joseph Surface, Sir Peter and Lady Teazle, and Lady Sneerwell, of *The School for Scandal*, belong to the same world of rich and rounded fragments as is inhabited by Falstaff, Shylock, Fluellen, Dogberry, Touchstone, Sir Toby Belch and Malvolio, Rosalind and Portia and Viola. All are in the words of the White King in *Through the Looking-Glass*, "as large as life and twice as natural."

The School for Scandal provides an excellent example of the blending of good literature with good "theatre." Thus it satisfies both the

unlettered man who sits in the theatre and the reader of the printed page who sees only with his imagination. It contains many fine acting scenes, that in which Lady Teazle hides behind a screen having often been cited as providing the perfect treatment of "situation."

To the graceful humour of Goldsmith, Sheridan, in the two plays named and in lesser later plays like *The Critic* and *The Duenna*, added the wit without the grossness of Congreve, and his turn of dialogue has a polish and sparkle and speed that should have served as a model to his immediate successors.

Instead, he was to be followed by another long, long period when dramatic achievement was never more than meagre and mean.

LESSON 37

English Drama: 19th and 20th Centuries

THE so-called Romantic movement of the early 19th century, which informed all other means of artistic expression with a new freshness of spirit, found no great dramatists at hand to give it worthy expression in the theatre. Indeed, upon drama the movement had an ill effect. The taste of the day was for the tragic and the heroic, as well as the darkly romantic; and there were many minor playwrights ready to concoct artificial and lurid dramas, and to satisfy public taste with romantic settings and costumes historical or exotic, and with both virtue and vice depicted in such exaggerated terms as to have little reality. At the same time the dramatic form as a literary device that had little to do with writing plays for the stage continued to attract the poets, and both Byron and Shelley adopted it, just as Browning, Tennyson, Swinburne, and even Robert Bridges were to do. It should be added that Tennyson's *Queen Mary*, *Harold*, and *Becket* were put on the stage with some measure of success.

The plays of Edward Bulwer-Lytton, **Lord Lytton** (1803–73), such as *Money*, *Richelieu*, and *The Lady of Lyons*, can be taken, with all their artificiality of sentiment, as examples of the less offensive type of dramatic concoction that prevailed upon the stage until mid-century. Other writers whose plays still possess a "period" value that makes them worth the study are Tom Taylor (one of whose plays Abraham Lincoln was watching in Washington when he was shot by an assassin), Douglas Jerrold, Dion Boucicault, and Charles Reade (*Masks and Faces* and *It is Never Too Late to Mend*). But the most interesting name in the history of these unrewarding years is that of **Thomas William Robertson** (1829–71), who attempted in *Caste* and *Ours* and other plays to return the dramatic art to a more natural relationship with ordinary life.

Not until the last decade of the century did good drama and good literature begin to coalesce once more as in the age of the Elizabethans and the all-too-brief years of Goldsmith and Sheridan; and the tradition, once established, has fortunately not only remained to this day but seems likely to develop. By that time, "theatre" itself had already begun to emerge from the doldrums, thanks to the craftsmanship in writing for the stage shown by two outstanding playwrights, **Henry Arthur Jones** (1851–1929) and **Sir Arthur Wing Pinero** (1855-1934). Plays like Jones's *Saints and Sinners* (1884) and Pinero's *The Second Mrs. Tanqueray* (1893) created new standards and greatly influenced the taste of the theatre-going public. Pinero in particular presented in his long succession of plays an illuminating picture and criticism of contemporary social manners and modes, and was the first to inspire a vogue for the "problem" play, the kind of play that asks "What should *A* do?" and having answered that problem in the final act leaves the audience to ask themselves "Should he have done it?" Both Pinero and Jones took to publishing their plays in book form, perhaps with the notion that the printed words would give them a literary look. But, in fact, their plays, when read, distil no literary essence. They depend for the most part for effect upon stage direction; their dialogue requires the emphasis of the actor's voice.

A third name should perhaps in fairness be added to the former two, that of **Sir William Schwenk Gilbert** (1836-1911). By himself he remains only a minor figure in literature and almost a nonentity in the theatre; yet in collaboration with the composer Sullivan he played his peculiarly inspired share. The series of comic operas which resulted from that lucky partnership was, and has remained for well over half a century, one of the most precious of all contributions to human enjoyment in the whole history of the theatre. If ever there was a case of putting two and two together and making infinitely more than four, it was here. Gilbert's lyrics with their ingenious rhyming, his sparkling and highly quotable dialogue, the exposition of topsy-turvy logic that has added the adjective "Gilbertian" to the language, and the creation of such memorable and distinctive grotesques as **Pooh-Bah, Bunthorne, Jack Point, the Duke**

of Plaza-Toro, and the Lord Chancellor in *Iolanthe*—all these can be claimed as literature, and the volume containing all the librettos of the so-called "Savoy operas" is well worth a place on the shelves of any literary man.

But even brighter stars soon began to scintillate—and almost simultaneously. **Oscar Wilde** (1856 1900), having already talked his way to notoriety and established himself as an insistent critic of the arts, demonstrated that he could do much more than talk and criticise, by producing a series of society comedies that were generally accepted as the wittiest since Sheridan—that is to say, for over a century. In some ways they were almost too brilliant, for Wilde could never resist an epigram or a paradox if it came his way, even if it had to be made at the expense of characterisation (a fault of which Sheridan was rarely guilty); and the unceasing brilliance of his wit often obscured the serious underlying motive of his theme. His work as a dramatist found its culmination in his last play, *The Importance of Being Earnest*, which is now accepted as a classic of English comedy. The theme of the play being deliberately and fantastically nonsensical, the wit is all that matters. The dialogue is superbly funny. Many find it even more entertaining to read it than to hear it on the stage, for then one has time to try to find an answer to the unanswerable, and, discovering that it *is* unanswerable, to savour it all the more. Moreover, and paradoxically, Wilde came nearer in this comedy than in his others to sharply defined characterisation.

It should be remembered that Wilde's career ended abruptly before his fortieth year. He ranks in literary history with the tragic and helpless ones, like Villon, Marlowe, Verlaine, and Francis Thompson; and to recall that he was born in the same year as Shaw (who wrote plays until he was ninety) is to wonder vainly what further great contribution might in happier circumstances have been made to dramatic literature. Even as it is, Wilde's service to the literary revival of the English stage is unforgettable.

George Bernard Shaw (1856-1950) is, chronologically, the second great figure in that revival. As a dramatist—and in the long run this versatile genius was more a dramatist than he was anything else—he owed much to the influence of Henrik Ibsen, the Norwegian master-dramatist. Like Ibsen, he sought to use the stage as a pulpit, as the vehicle of a message to the world. Drama must argue, demonstrate, convert.

Of all dramatists, Shaw is the least obviously dramatic. He begins by having some point of view to propound and expound, usually an original and deliberately challenging point of view concerning political or social philosophy. Some of his plays are propaganda pamphlets turned into dialogue for persons to repeat, seated or standing in different positions on the stage. Sometimes his "curtains" are no more than arbitrary stops, as though the super-talker (Shaw himself), seated "off stage" and prompting each speaker in turn, had suddenly decided that the audience should have a breathing-space so that they could go out into the foyer of the theatre and think over the brilliant stuff that the people on the stage have been uttering.

For brilliant stuff it all undoubtedly is. Shaw is not a master of characterisation, for he will not allow his puppets to speak for themselves. He asserts himself in every one. Therefore they are not so much recognizable human beings as denizens of a special Shavian world set on a high and purely intellectual plane. Such a world is an imaginative conception that is, in a way, poetic; and there is also something akin to poetry in the form and shape, the balance and rhythm of all the argumentation. If it is not poetry, it is very great prose. One critic has described it as "intellectualised verbal ballet."

Shaw regularly published all his plays in volume form, with lengthy "prefaces" (*see* Lesson 35). That is to say, he meant them to be considered as literature. Indeed, it is a matter of historical fact that many readers knew his earlier plays as literature long before they had any opportunity of seeing them on the stage. To read passages so well shaped, so

Oscar Wilde

Henry Arthur Jones

Sir Arthur Pinero

Sir James Barrie

beautifully presented, and so exclusively packed with thought as the Hell scene in *Man and Superman*, or the Inquisitor's long speech in *Saint Joan*, or the final sequence in the massive *Back to Methuselah* is to derive an immense wealth of intellectual pleasure.

Shaw's idealism is by no means less effective for being purely rational His conception of a finer civilization, free from hypocrisy and sham, is the logical outcome of that fundamental belief in the Life Force which he preaches with all the fervour, if not with the mystery, of a religion This Life Force expresses itself in matter, using the individual living thing as a tool. Neither omnipotent nor omniscient, it has to struggle against difficulties and limitations from which the world's pains and miseries result. Evolution is the continual experiment of the Life Force to perfect an instrument for its purposes. All this is stated here to show that Shaw's serious purpose when he is serious is as undeniable as his wit is irresistible when he is minded to indulge in his vigorous intellectual horseplay

That which is both best and most characteristic in Shaw is to be found in *Man and Superman*, *Heartbreak House*, *Back to Methuselah*, and *Saint Joan*, but there is rich entertainment, not to be missed, in *Arms and the Man*, *You Never Can Tell*, *Major Barbara*, *The Doctor's Dilemma*, *Getting Married*, *Caesar and Cleopatra*, *Pygmalion*, *Androcles and the Lion*, *The Apple Cart*.

If Wilde restored literary brilliance to English drama, and Shaw revived its literary force, **Sir James Matthew Barrie** (1860 1937) gave it a literary delicacy that was altogether new. Barrie had already published a fair amount of fiction and collections of light sketches before he discovered in drama a more rewarding medium for the expression of his whimsically wise humours. He excelled in warm-hearted sentimental comedy of a kind for which the vogue died at least a decade before Barrie himself died. But while the vogue lasted, Barrie was acknowledged as the master-craftsman in that line, and exercised an important influence by introducing new standards of finesse and stability in the writing of dialogue, the creation of character, and the resolving of human "situations." His greatest effects are achieved by apparently simple means, yet in fact they owed everything to a magical touch which died with him. One cannot analyse his elusive genius ; one might as well try to get a will-o'-the-wisp to pose for a portrait. Perhaps it may be said that there lurks behind every sentence he wrote the amused chuckle of a mischievous but charming child—a chuckle that is directed not only at the world about him but at all the fancies of his own imagination and the essential absurdity of his own self.

Barrie's most delightful plays include *Quality Street*, *The Admirable Crichton*, *What Every Woman Knows*, *Dear Brutus*, and *Mary Rose* ; but his masterpiece, and his most characteristic work is that perennial favourite, *Peter Pan*.

The plays of Barrie have proved as popular in printed form, i e as literature, as those of Shaw ; and both men underlined their claim to be read at home, as well as to be seen and heard in the theatre, by the care they took in preparing for the reading public an eminently readable style of stage direction. Barrie's so-called stage directions, as they appear in the printed versions, in which he describes the minutiae of a scene, introduces the various characters, or interprets their motives as they speak, are as rich in humour as they are shrewd in comment. Here is something hidden from those who merely see the plays on the stage It represents a special form of writing, at which some others have since tried their hand, though rarely with the same success as these two skilled masters

Yet it is significant of the renewed realization of drama's true place in literature, all but neglected for three centuries, to note how general has become the practice of printing plays for people to read, and how gladly the public has accepted the practice. The collected plays of A. A Milne, J. B. Priestley, and Terence Rattigan, as well as those of Wilde, Shaw, and Barrie, may stand congruously enough on the same library shelf as those of Shakespeare, Jonson, Marlowe, Congreve, and Sheridan. Indeed, the fact that an ever-increasing number of plays now stand up well to the searching test of print at least points to one conclusion : that the plays of the 20th century may or may not be more effective on the stage than those of earlier times, but they can certainly make a stronger claim for serious consideration as literature.

LESSON 38

English Drama : 20th Century (continued)

BEFORE leaving the story of English dramatic literature at the very hopeful point to which the middle of the 20th century has brought it, we may pass in brief review some of those playwrights who, following Wilde, Shaw, and Barrie, contributed most to the revival.

In 1906 **John Galsworthy** (1867–1933), who had been writing novels since 1898, turned his attention to the stage and thereafter achieved

John Galsworthy

W. Somerset Maugham

J. B. Priestley

James Bridie

equal distinction as novelist and as dramatist. To the writing of plays he brought a cultured, almost fastidious, taste. He presents, with intense earnestness of purpose, the various conflicts and perplexities of contemporary social life, in which his fine, dispassionate mind insists on seeing both, or all, sides of a question, although his heart often betrays him into ultimate sympathy with that side which social convention would deem the wrong or losing side. Thus in *The Silver Box*, *Justice*, and *Escape*, for example, the suffering human sinner or malefactor is depicted with a pity that is denied to the self-righteous accusers or the cold processes of the law. Galsworthy contrives to strike his most nicely-poised balance of sympathy in *The Skin Game* and *Loyalties*, and, perhaps as a consequence, these are usually considered his greatest plays. But all are serious and provocative, though because of their superb artistry none is ever dull.

William Somerset Maugham (b. 1874) is another novelist-playwright, who introduced to drama a stimulating acid touch, uncompromising and exact. In outlook he is the extreme antithesis to Barrie, having schooled himself rigorously to avoid any appearance of sentimentality or even of sentiment, and certainly preferring the bitter to the sweet, the sardonic to the sympathetic. He is at his best as a dramatic writer in *The Circle*, *For Services Rendered*, *Our Betters*, *The Constant Wife*, *The Sacred Flame*, and *The Breadwinner*.

Arnold Bennett (1867–1931) was as wilfully uneven in his dramatic output as in the rest of his writing, but from among his plays two, *Milestones* (in which he collaborated with Edward Knoblock) and *The Great Adventure* (a fantastic comedy based on one of his novels), are worthy to rank with his finest achievements in fiction, such as *The Old Wives' Tale* and *Riceyman Steps*.

Many good writers of the 20th century have lent their pens to the service of the stage, with varying success. G. K. Chesterton managed to write one play, Aldous Huxley has written two. Other novelist-dramatists include Clemence Dane, Eden Phillpots, Graham Greene, and Charles Morgan, and on a different level, Ian Hay, Edgar Wallace, and Agatha Christie, all of whom adapted their particular story-telling gifts to the requirements of stage technique with remarkable facility. Many shrewd critics have thought that Edgar Wallace, in plays like *The Calendar* and *On the Spot*, came far nearer to mature and serious achievement than in any of his innumerable volumes of " hack " thrillers.

Robert Cedric Sheriff (b. 1896), on the other hand, graduated somewhat startlingly as a fine dramatist before he turned his hand to writing novels, with that most moving of plays about the First World War, *Journey's End*. Nevertheless the double literary fulfilment stands to his credit, and his fiction and his dramatic work are alike marked by a fine naturalism and by thoughtful and sympathetic studies of character. **John Drinkwater** (1882–1937) had made a reputation as a lyric poet before he embarked on a series of biographical " chronicle " plays, of which the first and finest was *Abraham Lincoln*. Others were *Oliver Cromwell*, *Mary Stuart*, and *Robert E. Lee*. Another poet, **James Elroy Flecker** (1884–1915), did not live to see the success of his blank-verse tragedy of the glamorous East, *Hassan*, when it was put on the stage in 1922. **Alan Alexander Milne** (1882–1956) had made his reputation as a writer for *Punch* before turning his pen to the writing of charming light comedies like *Mr. Pim Passes By*, *The Dover Road*, and *The Romantic Age*.

One other name dominates all these—that of **John Boynton Priestley** (b. 1894), who has courageously experimented with every kind of play—comedy, farce, conversation piece, poetic fantasy, detective thriller, symbolism ; plays like *The Linden Tree*, which discuss topical problems, and others like *Johnson over Jordan*, which deal with eternal problems ; plays like *Time and the Conways* and *I Have Been Here Before*, which present in memorable dramatic form the time

in the story of English literature is an understatement; for it is even more true that English writers have, together with the French, and to a smaller extent the Russians, played the predominant part in the story of the novel as it has developed throughout the whole world.

But it cannot be claimed that the novel was indigenous to England. The very word is derived from *novella*, which was the Italian word for a new (or novel) kind of story that was introduced in that country early in the 17th century, depicting ordinary life as it was experienced by ordinary people, rather than the romantic wonders of that world of knights and ladies which had been the conventional background to prose fiction before the Renascence. Spain produced its own corrective to chivalrous romance in that great burlesque by Cervantes, *Don Quixote*, and in "the picaresque"- stories of adventurous roguery (*picaro* rogue). The novel quickly became, as it were, English by naturalisation, thanks to the translators of these and other works.

Early Fictional Forms

England had already produced its own forms of prose fiction, though it would overstretch the conveniences of classification to call them novels. The earliest examples, such as More's *Utopia* (1516) and Bacon's *New Atlantis* (1627) were written in Latin. The earliest original work in English to adopt the form of prose fiction was *Euphues*, by John Lyly (1553 1606), to whom, as a dramatist, these Lessons have already drawn attention. This appeared in 1579 80. Though the story has little to interest the modern reader, the style in which it was written originated the word "euphuism" and gave rise for a time to a form of fashionable conversation, mocked at by Shakespeare and Jonson, and later by Scott (Sir Piercy Shafton, in *The Monastery*).

Lyly's *Euphues* was followed by the posthumous *Arcadia* (1590) of Sir Philip Sidney (1554–86). Indebted as Sidney was both to Italian and to Portuguese influence, this pastoral romance has a ring of chivalrous sincerity that is absent from *Euphues*. Sidney borrowed, but he also gave. French and English writers alike were indebted to him. A later critic writes:

> The *Arcadia* is in some sort a half-way house between the older romances of chivalry and the long-winded "heroic" romances of the seventeenth century. Action and adventure are already giving way to the description of sentiment, or are remaining merely as a frame on which the diverse coloured flowers of sentiment may be broidered

As for the 17th century, if it brought little else to the development of English fiction, it gave the world John Bunyan's *Pilgrim's Progress*, the first great allegorical narrative, for which to this day it can be claimed that no other imaginative narrative of any age has been so often read or so widely loved. The first part was published in 1678, the second in 1684. The style throughout is closely—and, in view of its subject, appropriately—modelled on that of the Authorised Version of the Bible.

Also deserving some mention is Mrs. Aphra Behn (1640-89), spy, brilliant conversationalist who scintillated even among the Restoration wits, and the first Englishwoman to become a professional author. She was also the first English writer of any note to use the narrative form for the depiction of contemporary life, and the first one to advocate the abolition of slavery. Her *Oroonoko*, dealing with an enslaved African prince, influenced Chateaubriand and J.-J. Rousseau. Mrs. Behn was mentioned in Lesson 36 as a minor dramatist.

LESSON 40

The English Novel: 18th Century

The next important development came early in the 18th century. It began with **Daniel Defoe** (1659–1731), often called the "father" of the English novel as well as the founder of English journalism. Realism reached immediate perfection with his *Robinson Crusoe* (1719) and *Moll Flanders* (1721). By introducing his journalism what would nowadays be called "reportage" into these stories, inventing a wealth of documentary detail that appears to corroborate the truth of his narration, he gave a greater illusion of reality than anyone in any country had done before.

Incidentally, both these stories are told in the first person singular, an autobiographical device that heightens the illusion even further; and it is noticeable how many of the later novels that are ranked among the world's masterpieces employ the same device, among them being *David Copperfield*, *Jane Eyre*, *Wuthering Heights* (a veritable Chinese puzzle of personal narrations, one within the other), and *Henry Esmond*. There are few novelists who have not written at least one novel in the first person.

In 1726 came Swift's immortal story-book, popularly called *Gulliver's Travels*, conceived as a satire but using so successfully Defoe's device of invented corroborative detail that the reader is only too ready to forget the satire in the delight of the narrative. Neither Defoe nor Swift seeks to make any great appeal to the emotions. The part of both men in the development of English prose in general is considered in Lesson 30.

Next came the first English novels to be conceived entirely with ordinary domestic life and manners—and they were evolved almost by accident! **Samuel Richardson** (1689-1761) was, as a boy, the confidant of the young women in the neighbourhood of his Derbyshire home. He read and wrote their love-letters for them. Years later, when he was fifty years old and a printer, he was induced by two bookseller friends to concoct a volume of specimen letters such as would serve as a model for all letter-writers. Although this task was duly completed, and the volume published under the title *Familiar Letters on the Useful Concerns in Common Life*, it occurred to him, during the compilation, that such letters might be made more instructive and interesting if they were so written as to unfold a single connected love-story and point a useful moral. The result was *Pamela; or, Virtue Rewarded*, published in 1740, even before the *Familiar Letters* volume. His early experiences stood him in good stead here; for so great was the vogue of *Pamela*, especially among women, that he wrote two other epistolary novels, *Clarissa Harlowe* (1747-48) and *Sir Charles Grandison* (1753). The three form a kind of trilogy, dealing respectively with humble, middle-class, and high life.

Although these three novels contain much that is of value to the student of 18th-century life, they are little read to-day. They have a forbidding prolixity and contain much pretentious moralising and stagnant sentimentality. Moreover, the epistolary form was too clumsy to survive, although later writers have sometimes tried their hand at it as a novelty—indeed it may be noted that one of the most popular of 20th-century "best-sellers," *Daddy Long-Legs*, by the U.S. writer Jean Webster, was presented in that form, though by no means to the same exhaustive length.

But posterity has one reason to be grateful that Richardson adopted his particular style, for they prompted another and a greater man to burlesque it. This was **Henry Fielding** (1707-54), in his *Joseph Andrews*, which was published two years after *Pamela*. But Fielding, for all his satirical intention, became so interested in the characters he created that he could not bother to sustain the burlesque, producing instead a novel in its own right, with characters—such as Parson Adams—far more alive, robust, and amusing than any of Richardson's. Moreover, having savoured the pleasure of novel writing, Fielding went on to write his masterpiece, *Tom Jones* (1749), the first great English novel, rich, rollicking, and as readable to-day as it was to the author's contemporaries. Fielding's third important novel was *Amelia* (1751). Fielding was a barrister, and his knowledge of law distinguishes all his writings. In *Amelia* the reformer and lawyer take precedence over the novelist, but the book is none the less interesting to a modern reader, abounding as it does in passages of great power and beauty.

As a literary artist Fielding has a place above Richardson. He is a humorist, which Richardson is not. His knowledge of life is wide, his sympathies are catholic, his humour is of the rarest vintage, his style is like the vigour of a spring morning, and his constructive faculty is classical; his novels are as charged with life to-day as when they first won the admiration of his contemporaries. Dr. Johnson considered *Tom Jones* vicious, though he was fascinated by *Amelia*; but if the former great novel is too indulgent to the frailties of man, it is an open question whether it may not be so and yet remain a work of sounder morality than Richardson's *Pamela*, in which we are supposed to witness "virtue rewarded," but a brand of "virtue" that will not bear analysis. Fielding is securely a classic; he has, moreover, created a crowded gallery of memorable characters, and there could be no surer test of the true novelist.

LESSON 41

The 18th-century Humorists and Romantics

THE series of lectures by Thackeray, printed under the title *The English Humorists of the 18th Century*, includes three other novelists in addition to Fielding. They are Sterne, Smollett, and Goldsmith. Concerning **Laurence Sterne** (1713-68), however, a distinction is made with which most modern readers will agree. The distinction is that Sterne is a great jester rather than a great humorist. "He is always looking in my face, watching his effect, uncertain whether I think him an impostor or not; posture-making, coaxing, and imploring me." The author of *Tristram Shandy* and *A Sentimental Journey* owed much, doubtless, to an acquaintance with the works of Rabelais and Cervantes and Burton's *Anatomy of Melancholy*, but, as Augustine Birrell has said, "Sterne is our best example of the plagiarist whom none dare make ashamed." In Corporal Trim and "My Uncle Toby," he has created immortal types of character; they would raise *Tristram Shandy* to a place among the classics of English prose fiction even without the spirit of inimitable discursive drollery which rattles through its pages. Among Sterne's defects are a furtive, sniggering indecency and a reflection of the mawkish sentimentality to which his age was prone.

Often careless of his grammar, Sterne can on

Samuel Richardson Henry Fielding Laurence Sterne Tobias Smollett

occasion find the "only word." His slipshod method cannot be held up to admiration, but it adds to the carefree and exuberant expression of his jests.

The "Hogarth of English letters" is a term that has been applied to **Tobias Smollett** (1721-71). A Scots critic, David Masson, includes *Roderick Random*, *Peregrine Pickle*, and *Humphrey Clinker*, along with Fielding's *Joseph Andrews* and *Tom Jones* among the most amusing novels in the language. In them, he says, "for the first time British literature possessed compositions making any approach, in breadth, bustle, and variety of interest, to that form of literature, always theoretically possible, and of which other countries had already had specimens in *Don Quixote* and *Gil Blas*—the comic prose epic of contemporary life." Fielding and Smollett present the kaleidoscope of life, whereas Richardson focuses attention upon his chief characters. Smollett is rough, rumbustious, and intensely masculine. His stories are a sequence of high jinks and practical jokes. He has no use for plot, but his characters are clearly and shrewdly drawn, and the reader is sufficiently attracted by them to be always anxious to discover what they will do next

Of **Oliver Goldsmith** (1728 74), to whose masterly and delightful achievements in other domains of literature attention has been drawn in earlier Lessons, it has been said that *virginibus puerisque* might have been his appropriate and uncontested motto. His one novel, *The Vicar of Wakefield*, which appeared in 1766, was written with a moral motive akin to that which induced Richardson to write *Pamela*. "There are a hundred faults in the thing," says the author in his preface; but, as well has been observed, a hundred things might plausibly be said to prove them beauties.

Some seven years earlier, the novel having now come well to the fore in literature, **Samuel Johnson** (1709 84) essayed his *Rasselas*, writing it during the evenings of a single week. It is a prose narrative embodying the views expressed in his poem, "The Vanity of Human Wishes," and it has been compared with Voltaire's *Candide*, with which it has something in common. Dr. Johnson's true genius, however, lay in other directions.

But already the novel was reflecting the beginnings of that reaction towards romanticism which was in full sway at the close of the century. There came into existence a tendency to tickle the palate of the common reader with tales of so-called "Gothic romance," a euphemism for fantastically conceived stories of adventures in remote and gloomy castles. Horace Walpole, in *The Castle of Otranto*, produced in 1764 one of the best of the supernatural type. There were many others that have endured in reputation at least until our own day: Henry Mackenzie's *The Man of Feeling*, for example; *The Monk*, a thriller by Matthew Gregory Lewis; *Vathek*, a powerfully imaginative conception by William Beckford; and Charles Robert Maturin's *Melmoth the Wanderer*.

The number of women writers who now came forward in response to the demand for interesting and sensational novels is noteworthy. Clara Reeve enjoyed a measure of popularity with romantic fiction like *The Old English Baron*; one could mention also Charlotte Smith, Mrs. Opie, Regina Marie Roche, and the ultra-romantic Mrs. Ann Radcliffe, who, in *The Mysteries of Udolpho* and several other novels, showed herself to be an incomparable adept at the art of exciting narration.

But there were two women novelists of the period who excel over all these. **Fanny Burney,** Madame d'Arblay (1752-1840), remains one of the most attractive literary figures of her day. When she was only twenty-six, she published *Evelina*, which, according to Macaulay, "was the first tale written by a woman, and purporting to be a picture of life and manners, that lived or deserved to live. It took away reproach from the novel." Written in the epistolary form, it was issued anonymously by a firm that did not know the name of the writer, and attained an

immediate and immense success, which gave the author a foremost place in the literary world of her day.

Fanny Burney, who was the second daughter of Dr. Burney, eminent and scholarly writer on music, had picked up an education at home, without any tuition whatever, but had the advantages of browsing in her father's large miscellaneous library, and of observing his brilliant circle of friends. She knew something of the Johnson circle before she wrote *Evelina*, and became the doctor's pet. Later she wrote *Cecilia*, longer and more complex than *Evelina*, and for this she received £250. *Camilla* brought her over £2,000.

The appearance of *Evelina* was an important event in the annals of fiction, for Fanny Burney had caught the secret of the quiet charm of entirely credible events imagined as taking place in the course of everyday domestic life. She was the precursor of a greater than herself—Jane Austen.

The second woman novelist of classic measure to arrive at this period was **Maria Edgeworth** (1767–1849), whose delightful character finds eloquent expression in her first novel, *Castle Rackrent*, published anonymously in 1800. This is in many respects her best work. Later came *The Absentee*, *Belinda*, *Helen*, *Tales from Fashionable Life*, and *Moral Tales*. Sir Walter Scott confessed that it was his reading of these stories of Irish peasant life that first made him feel "that something might be attempted for my own country of the same kind as that which Miss Edgeworth so fortunately achieved for Ireland"; something that would procure for his own countrymen "sympathies for their virtues and indulgence for their foibles."

One may logically end the survey of this period by moving forward a little to the year 1818, and a very notable work by another woman writer, **Mary Wollstonecraft Shelley** (1797–1851)—though her story was originally published anonymously. This was the celebrated *Frankenstein*, an imaginative *tour de force* of unmitigated horror, yet possessing sufficient of the essential elements of human interest and imaginative vitality to make it possibly the finest and certainly the most enduring achievement in the "nightmare" school of fiction.

LESSON 42

Jane Austen, Scott, and their Successors

Jane Austen

Sir Walter Scott

W. Harrison Ainsworth

Mary Russell Mitford

The history of the English novel in the earlier years of the 19th century is dominated by two figures of supreme importance—Jane Austen and Sir Walter Scott. Both remain unexcelled in their own spheres.

Jane Austen (1775–1817) wrote six novels: *Sense and Sensibility* (1811), *Pride and Prejudice* (1812), *Mansfield Park* (1814), *Emma* (1816), *Northanger Abbey* (1818), and *Persuasion* (1818)—all of which were written either in her father's house, the Rectory at Steventon, near Basingstoke, or, after his death, in the house at Chawton, where she lived with her mother and sister. Her close intimacy with the sister enabled her to express sisterly relationships with exquisite understanding in her novels. Though slow to publish, Jane Austen began writing at a very early age. *Pride and Prejudice* was begun in 1796; *Northanger Abbey*, which, like *Persuasion*, was published after her death, was begun about 1798.

Macaulay suggested that Jane Austen most nearly among writers approached Shakespeare in the genius for character drawing which she displays in her novels; also that there were in the world no compositions "which approach nearer to perfection." She wrote in direct opposition to the "Gothic" romances in vogue at the end of the 18th century. *Northanger Abbey*, indeed, is in part a parody of

Mrs. Radcliffe's *The Mysteries of Udolpho* and other blood-curdling fiction, best-sellers of the day. A notable feature, apart from her charming sense of humour, is the impersonal nature of her works. She tells nothing about herself, and is unconscious of any happenings beyond the immediate circle of her own characters. She is a satirist minus indignation; hers is the quiet irony of the cultured mind. Her stories are developments of character; they are neither emotional nor sentimental. They contain no startling, indeed no unusual happenings. It is commonly remarked that the fall of Louisa Musgrave from the stone Cobb at Lyme Regis (in *Persuasion*) is the only "incident" in all her writings. For the rest, her characters visit one another's houses, go for walks and on picnics together, sometimes play mild parlour games together, fall in and out of love with one another, and indulge in much gossip and match-making. To study her books is to learn what went on in the average English parsonage, villa, and town and country house at the beginning of the century.

Jane Austen's method was highly appreciated by Scott. After the third reading of *Pride and Prejudice* he wrote:

> The big bow wow strain I can do myself, like any now going, but the exquisite touch which renders ordinary commonplace things and characters interesting from the truth of the description and sentiment is denied me. What a pity such a gifted creature died so early!

She has been compared to a miniature painter, but few have possessed her distinctive touch—a touch which enabled her to portray the scenes of quiet contemporary life with precision of detail and yet to maintain in the pattern of her novels a true relation with humanity at large.

Sir Walter Scott (1771–1832) is easily first among the writers of English historical romance. His career illustrates the renewal and decision of the old battle between verse and prose for the prerogative of handling romantic themes. Scott "took the bread out of the mouths of novelists" by his metrical romances, to which reference was made in Lesson 21; then, turning to prose, he proved that the historical and romantic interests need not be imperilled by the admixture of qualities that are known only to prose. In his works the novel proper and the romances were at last wedded indissolubly.

Scott's genius was stirred by several factors—among them being the French Revolution, the Napoleonic wars, Percy's *Reliques of Ancient English Poetry*, the songs of Burns, the ballads of Burger, and the early poems of Goethe. Nor must the example of Fielding be discounted. But, as was mentioned in the preceding Lesson, the Irish novels of Maria Edgeworth first inspired in him the thought which found such eloquent expression in that vast treasure-house, the "Waverley" novels.

As a preliminary to their reading one should study the General Preface, written by Scott in 1829, which will be found in the first volume of all good editions; and also the "Epistle Introductory" to *The Fortunes of Nigel*, written in 1822. He explains, in the Epistle, that he was quite aware of the aims of Fielding, Smollett, Le Sage, and others, as writers of novels, but he goes on to say that it was enough for him to

> write with sense and spirit a few scenes, unlaboured and loosely put together, but which had sufficient interest in them to amuse in one corner the pain of body; in another to relieve anxiety of mind; in a third place to unwrinkle a brow bent with the furrows of daily toil; in another to fill the place of bad thoughts, or to suggest better; in yet another to induce the idler to study the history of his country; in all, save where the perusal interrupted the discharge of serious duties, to furnish harmless amusement.

It was Scott who first made the dry bones of history live. The casual reader needs to be reminded of the stores of varied and accurate learning which were garnered in that capacious mind. It is important also to recognize Scott's method of dealing with history. He never made a famous historical character the central personage of his tale. He never coped with the records of actual events. But he achieved such effects as were altogether denied to some of the most painstaking among academic historians.

Scott's novels do not finally depend for their popularity upon their plots. Taking time to arrange a story was a sore point with Scott. He confesses that "the regular mansion" he always strove to build "turned out a Gothic anomaly." But it is questionable whether anyone would have been so long held captive by the spell if he had achieved those trim-built mansions he set out to construct, instead of the crazy, gargoyled edifices reared by his rich and vigorous imagination. In the very irregularity of plot and style lies half the charm and all the vitality of the Waverley novels. Of his style, the best that can be said is that it is a free and easy medium wherewith he brings his scenes and persons vividly before us. His merit is so gigantic that he can be made the subject of the severest criticism in detail, concerning which he was often slovenly—owing in part to the pressure of external circumstances under which he was constrained to work—without detracting from the mighty mass of his achievement.

By taking up the novels in the order in which they were published rather than as fancy or other reasons may dictate, the student will learn to discern the workings of the author's mind in dealing successively with special phases of character and particular situations in human life. Scott's introductions and notes can well be reserved for consideration until each story has been read.

The accompanying table gives the date of publication of the novels and an indication of the period with which each one deals. A glance at the list will serve to show that with few exceptions Scott, for all his love of the Gothic, preferred to deal in his novels with periods not far remote from his own time.

For sixteen years the Waverley novels succeeded one another without a pause; and for the last ten of those years, at least (to quote Herford in *The Age of Wordsworth*), "their appearance was watched for as eagerly in Paris and Weimar as in London. The novels enlarged the intellectual horizon of all Europe, created in half a dozen nations the novel of national life, and opened a new epoch in the study of history."

Chronological List of the Waverley Novels

Date	Title	Period
1814	Waverley, or 'Tis Sixty Years Since . .	1745
1815	Guy Mannering	1760
1816	The Antiquary . ..	1798
1816	Old Mortality* .. .	1679
1816	The Black Dwarf* .	1708
1818	Rob Roy .	1715
1818	The Heart of Midlothian* .	1736
1819	A Legend of Montrose*	1644
1819	The Bride of Lammermoor*	1700
1819	Ivanhoe . .	1194
1820	The Monastery	1559
1820	The Abbot	1570
1821	The Pirate	1700
1822	Kenilworth . .	1575
1822	The Fortunes of Nigel . .	1620
1823	Quentin Durward .	1470
1823	Peveril of the Peak . ..	1660
1824	St Ronan's Well	1804
1824	Redgauntlet	1770
1825	The Betrothed . ..	1187
1825	The Talisman .	1193
1826	Woodstock .	1651
1827	The Surgeon's Daughter†	1765
1827	The Two Drovers† .	1765
1827	The Highland Widow†	1755
1828	My Aunt Margaret's Mirror	1700
1828	The Tapestried Chamber	1780
1828	The Laird's Jock	1600
1828	The Fair Maid of Perth† .	1402
1829	Anne of Geierstein . .	1474
1828 } 1830 }	Tales of a Grandfather ..	{ 1707 { 1788
1831	Count Robert of Paris*	1090
1831	Castle Dangerous*	1307

* Tales of My Landlord
† Chronicles of the Canongate

The influence of such a literary giant as Scott in style of narration and range of subject matter upon a host of lesser novelists was immediate and obvious. The Waverley novels opened the way for other essays in historical fiction, such as the works of **George Payne Ramsford James** (1799–1860), of little interest to-day; the more popular, more enduring books of **William Harrison Ainsworth** (1805–82), of which the best are *Old Saint Pauls*, *The Tower of London*, and *Guy Fawkes*, depending for their attraction upon a succession of exciting and startling incidents, sometimes bordering on the fantastic; and the even more sensational and successful historical romances of **Lord Lytton** (Edward Bulwer-Lytton, 1st Baron Lytton, 1803–73), such as *The Last Days of Pompeii*, *The Last of the Barons*, *Rienzi*, and *Harold*. Lytton was in his own lifetime among the most prominent and popular of novelists, occupying in fiction a place somewhat analogous to that of Byron in poetry, though infinitely cruder as an artist. In addition to writing showy historical fiction, he posed as the man of the world in *Pelham*, as the man of feeling in *Ernest Maltravers*, as the man of mystery in *Zanoni*. *A Strange Story* is a horror novel, *Paul Clifford* and *Eugene Aram* are crime novels, while *The Caxtons* and *My Novel* are novels set in the ordinary sphere of domesticity.

As the interpreter of Scottish national life, Scott was followed by **John Galt** (1779–1839) with a long series of tales, of which *Annals of the Parish*, *The Provost*, and *Sir Andrew Wylie* are among the most rewarding. Irish writers were not slow to take the hint. They include **William Carleton** (1794–1869), a peasant writer, who received his education in a "hedge school," and wrote, from what in his day was an unaccustomed angle, some notable tales of Irish rural life; **Samuel Lover** (1779–1868), writer of songs, dramas, and high-spirited rollicking stories of conventionally acceptable Irish humour, such as *Rory O'More* and *Handy Andy*; and **Charles Lever** (1806–72), author of *Charles O'Malley* and some three-dozen other novels. Lever's brilliant caricatures should not be taken as composing a picture of anything like the realities of Irish life and character.

Other writers discovered the romance of the sea, the earliest being **William Nugent Glascock** (1787–1847). Others were **Michael Scott** (1789–1835), author of the breezy *Tom Cringle's Log* and *The Cruise of the Midge*, and the more celebrated **Captain Frederick Marryat** (1792–1848), who contributed to the literature of sailors and the sea *Midshipman Easy* and *Peter Simple*, and wrote those two excellent tales for younger readers, *Masterman Ready* and *The Children of the New Forest*.

But Jane Austen was not without her immediate influence either, especially upon subsequent writers of her own sex, who on the whole—fortunately perhaps—preferred in their novels to reflect the world as they saw it from the domestic hearth rather than to follow Mary Shelley and Mrs. Radcliffe in their pursuit of blood-curdling horror. **Mary Russell Mitford** (1787–1855) wrote *Our Village*, a series of

delightful sketches which enshrine the life of the little hamlet of Three Mile Cross, near Reading, with a fancy, brightness, and pleasant humour all her own. **Susan Edmondstone Ferrier** (1782–1854) was a caustic but at heart kindly delineator of old maids, pretty inanities, gauche doctors, and mock heroes. She found a wealth of material for her satire in the Edinburgh society amid which she moved, and gave it permanence in her *Marriage*, *The Inheritance*, and *Destiny*. **Frances Trollope** (1780–1863), mother of Anthony Trollope, wrote many novels, of which *The Vicar of Wrexhill* and *The Widow Barnaby* not only are her best but also by their titles reveal her chosen range of subject, a range which her more famous son was to exploit more fully and rewardingly at a later date.

A minor novelist, standing in a class by himself, is **Thomas Love Peacock** (1785–1866), who poured into his novels—*Headlong Hall*, *Melincourt*, *Nightmare Abbey*, *Crotchet Castle*, and others—no little wit and knowledge of character, chiefly his own character, with its own brand of hedonism and worldly virtue and venial sin. The erudite satire of his work, though forbidding to the general reader, should not deter the student. The whimsical, wayward charm of his books is further enhanced by the lyrics which are freely scattered through the pages.

LESSON 43

The Great Victorian Novelists

Charles Dickens

W. M. Thackeray

Charlotte Bronte

Emily Bronte

ALTHOUGH few people may have recognized it at the time, the middle decades of the 19th century witnessed the culmination in the development of the English novel. That seed which had been first sown by the Spaniards and Italians, which had germinated with Bunyan and Defoe, which had sprung into leaf with Richardson and Fielding, budded with Jane Austen, and flowered with Scott, now came to full, mature, and glorious fruition and fulfilment in the mighty achievements of Dickens, Thackeray, George Eliot, the Brontë sisters, and other writers whose genius seems to burn the less brightly only because it glows in such close chronological proximity to that of the giants. For there undoubtedly were giants in those days. Never has there been such a group of great writers working contemporaneously. Few such periods in English literary history can be compared with, say, the years 1847–50, which brief span of time saw the publication of *Dombey and Son* and *David Copperfield*, *Vanity Fair* and *Pendennis*, *Jane Eyre* and *Wuthering Heights*—all of them now reckoned among the immortals. (Within the same period Tennyson produced "In Memoriam," and Elizabeth Barrett Browning her *Sonnets from the Portuguese*, Ruskin wrote *The Seven Lamps of Architecture*, and the second volume of Macaulay's *History of England* appeared.) In the next few years were published several other works of fiction which have now survived in fame and favour for over a hundred years, among them *Henry Esmond* (1852), *Bleak House* (1853), *Villette* (1853), *Lavengro* (1851), *Cranford* (1851–53), *Westward Ho!* (1855), *Barchester Towers* (1851), and the classic story of school life, *Tom Brown's School Days* (1857). Could anyone dare to prophesy similar survival for as many English novels published in the 1950s?

Novels in the heyday of Dickens and Thackeray were full-bodied as well as full-blooded. *Bleak House*, for example, is some 350,000 words in length. It is not suggested that the quality of a novel can be determined by its length. Yet it cannot be doubted that a long novel allows greater opportunity for the development, or at least the presentation, of the characters. The reader becomes acquainted with them gradually, as with people met in real life; he has time to think about them and to learn to know them

all the more intimately. Nevertheless, every novel has its own natural length, varying infinitely with its theme. George Eliot's *Silas Marner* is, as Victorian novels go, short, but it is so superlatively good that one would not wish it to be longer. The short *Vicar of Wakefield* holds its place beside all its sprawling contemporaries, including even *Tom Jones*. The fact is that the length of a novel is sometimes dictated by fashion, sometimes by the economics of the publishing industry. During the first half of the period now under consideration most novels were issued to the booksellers in two fat volumes, but later the accepted form changed to three rather slimmer volumes, and the "three-decker," as it was commonly called, held the field in popular favour almost to the end of the century. The reasons for its eventual disappearance at the turn of the century will be noted in a later Lesson.

The exuberant creative genius of **Charles Dickens** (1812–70) happily found its expression in the novel. One says "happily" because Dickens also possessed high dramatic gifts, and as a youth was strongly attracted to the stage. In later life his gift in this direction enabled him to become a unique kind of public entertainer, giving delight to thousands of people in Great Britain and the U.S.A. (and incidentally making a large fortune) by giving recitals from his own works which were acknowledged as a histrionic *tour de force*. But he would have been less successful in this had not his works themselves possessed a strong dramatic quality, giving every incident he described a vivid actuality. No stories are more eminently suitable for reading aloud than those of Dickens.

In addition to this dramatic quality, which in the development of a plot only too often degenerated into a melodramatic quality, the outstanding characteristics of Dickens as a writer are found in his superb, unflagging humour; a sensitiveness to pathos, and a tendency to sentimentality more appreciated by his contemporaries than by later readers; a passionate sympathy with, and championship of, the poor and oppressed against all forms of privilege and injustice; a love of "homeliness" and good cheer; and, above all, an inventive genius never excelled in the creation of highly individual and unforgettable characters—great comic characters, oddities and grotesques, lovable and warm-hearted characters, many arch-hypocrites, arch-humbugs, and arch-villains.

The names of some of the more familiar characters are listed in the accompanying table; but there are hosts of others, for it was Dickens's peculiar gift to be able to make a character memorable even if he or she appears only on a single page.

MEMORABLE CREATIONS OF CHARLES DICKENS

The date given after each title is that of publication of the book in volume form.

The Pickwick Papers (1837)
Pickwick, Sam Weller, Tony Weller, Stiggins, Serjeant Buzfuz, Jingle, Bob Sawyer, the Fat Boy

Oliver Twist (1838)
Fagin, Bill Sikes, Bumble, the Artful Dodger.

Nicholas Nickleby (1839)
Squeers, Mantalini, the Crummles family, Mrs. Nickleby the Cheeryble brothers.

The Old Curiosity Shop (1841)
Little Nell, Quilp, Dick Swiveller, "The Marchioness," Mrs. Jarley, Sampson and Sally Brass, Codlin and Short.

Barnaby Rudge (1841)
Sim Tappertit, Dolly Varden.

Martin Chuzzlewit (1844)
Pecksniff. Mrs Gamp, Mark Tapley, Tom Pinch.

Dombey and Son (1848)
Paul Dombey, Captain Cuttle, Mr Toots, Major Bagstock, Dr Blimber, Mrs Pipchin, Miss Tox.

Christmas Books (1843–48)
Scrooge, Bob Cratchit, Tiny Tim, Trotty Veck, Tilly Slowboy, Caleb Plummer.

David Copperfield (1850)
Micawber, Daniel Peggotty, Uriah Heep, Steerforth, Tommy Traddles, Mrs Gummidge, "Little Em'ly," Dora Spenlow, Betsey Trotwood, Mr Dick.

Bleak House (1853)
John Jarndyce, Mrs Jellyby, Miss Flite, Mr. Turveydrop, Mr. Guppy, Grandfather Smallweed, Mr. Chadband, Inspector Bucket, "Jo" the Crossing Sweeper

Hard Times (1854)
Gradgrind, Josiah Bounderby, Mrs. Sparsit.

Little Dorrit (1857)
"Mr. F's Aunt," Flora Finching, Mr Dorrit

A Tale of Two Cities (1859)
Sidney Carton, Madame Defarge, Dr. Manette, Mr. Lorry, Jerry Cruncher.

Great Expectations (1861)
Miss Havisham, Joe Gargery, Uncle Pumblechook, Mr. Wopsle, Mr. Wemmick, Mr. Jagger, Herbert Pocket

Our Mutual Friend (1865)
Mr. and Mrs. Boffin, the Wilfer family, Mr. and Mrs Veneering, Silas Wegg and Mr Venus, Lizzie Hexam, Eugene Wrayburn, "Jenny Wren," Bradley Headstone, "Rogue" Riderhood, "The Analytical Chemist."

The Mystery of Edwin Drood (unfinished, 1870)
John Jasper, Mr. Sapsea, Rev. Septimus Crisparkle, Helena Landless, Mr Grewgious, Miss Twinkleton, Durdles

It is beyond all computation how many have been helped to smile through their tears and to take their courage in both hands under the influence of Dickens's books. He recognized and revealed the soul of goodness in ordinary things. Not only has he enshrined in his wonderful portrait gallery the tragic and comic annals of the poor of a period now happily past, but he has shown insistently the possibilities of goodness and happiness even in the

most unpromising circumstances and characters. The reader is persuaded that every strong emotion which the books call forth from him were felt equally by the writer, that Dickens loved his own characters, laughed with their happiness, wept over their misfortunes, shuddered instinctively at the horrors he was sometimes compelled to describe, and took a real joy in thwarting his villains and bringing them to final discomfiture. Indeed, he put so much of himself into his own creations that he himself was profoundly affected by the death of his Little Nell, and after writing of the death of little Paul Dombey he tramped the streets for the whole of one night, too agitated for sleep. He could never be called a dispassionate writer, aloof from his story. He is the friendliest and most widely beloved of novelists, always at one with his creations and with his readers, entertaining them, compelling them, teaching them.

The son of an impoverished clerk in the navy pay office, Dickens was "self-educated." As a sick lad of eleven years old he had been sent to work in a blacking factory, and this experience—not revealed until after his death—left an indelible mark upon him. The phenomenal success of *The Pickwick Papers*, his first major essay in fiction, brought him at the age of twenty-five to fame, wealth, and a leading position in the literary world which he never lost. Because of his lack of any regular higher education, his writing may have its obvious limitations—for example, the Dickens world, a vivid world projected by a vivid imagination, is shut to the glories of art and the achievement of science; but it is fair to say that he possessed in superlative degree the virtues of his own defects. A Charles Dickens whose university had been that of Oxford or Cambridge instead of a blacking factory and a reporter's desk, would have been so much the less the Charles Dickens who has commanded the affection of millions.

William Makepeace Thackeray (1811–63) is the only giant among Victorian novelists whose stature is comparable to that of Dickens. But stature is the only real point of comparison, for the two men were utterly unalike, both as men and as writers. Thackeray was educated at Charterhouse and Trinity College, Cambridge. He entered the Middle Temple before forsaking the law for journalism. A confirmed clubman, Thackeray mingled freely in the best society of his time, and found the right subjects for his art in the world of rank and fashion and wealth. Versatile and cultured, he wrote some delightful light verse and some first-rate criticism. For many years he was a regular member of the staff of *Punch*, and in 1860 became the first editor of the *Cornhill Magazine*.

But it is on his imaginative novels that his fame rests most securely. Chief among these are *Vanity Fair* (1848), *Pendennis* (1850), *Henry Esmond* (1852), *The Newcomes* (1853), and *The Virginians* (1859). Of these, *Esmond* and *The Virginians* are set in the 18th century, *Esmond* presenting a perfectly contrived picture of life in the days of Queen Anne, *The Virginians* carrying the same familiar lives forward through two generations to the later half of the century. In each book appears one of the most bewitching of all fictional women, Beatrix Esmond—in *Esmond* as a light-hearted and false-hearted young woman, in *The Virginians* as a wicked but much more lovable old lady. The other three novels deal with more-or-less contemporary life and manners, even though, for the purposes of the story, *Vanity Fair* is set in the years immediately preceding the Battle of Waterloo in 1815; indeed some critics would say that even in *Esmond*, for all the scholarly accuracy in the depiction of its Queen Anne background, the central figure belongs more truly to the reign of Queen Victoria.

Some would aver that the ultimate test of a great novel is that it teaches truths of human life and conduct, that it adds to the reader's store of knowledge and wisdom. Thackeray's fiction stands up well to this test. *Vanity Fair* admirably exemplifies Thackeray's creed, which is that goodness, however scorned, can be its own sufficient reward. At the same time, no one can read this magnificent work of fiction without realizing a great measure of sympathetic understanding of the central character, the attractive adventuress Becky Sharp.

Thackeray has been too readily called a cynic. There is undoubtedly some force in the contention that while he sees, loves, and makes his readers love the higher, brighter, purer aspects of human nature and conduct, he used a surer touch in depicting what was base and artificial. At times he can be as coy and sentimental as Dickens—with his heroines, for example, and with the admirable Colonel Newcome—though one can never imagine Thackeray weeping over the fate of any of his characters. It is more fair to describe him as a great satirist, and one peculiarly sensitive to the vice of snobbery and the unduly large part that vice may play in the complex interplay of human motives. Quite frankly, he plays the showman, presenting his characters as so many amusing puppets dancing to his tune and ready to be replaced in the box the moment the show is over. Often the showman supplies his own running commentary on the motives, actions, and words of the puppets, a habit that offends many readers, who would prefer to have less of Thackeray as an intermediary, and the characters acting more freely of their own volition. But the show itself is almost invariably brilliant.

The Brontë sisters—Charlotte (1816–55), Emily (1818–48), and Anne (1820–49)—burst briefly and powerfully on the literary scene in 1847, and left between the three of them seven novels, all remarkable when one considers the circumstances in which they were written. They lived in the West Riding village of Haworth, on the verge of the moors and at that time fairly isolated. Their father, the local vicar, educated them, and encouraged them to vie with each other in writing imaginative stories. They all became governesses for a time, but returned to the restricted life of the parsonage. Secretly they wrote poems, and in 1846 these were published pseudonymously (the names Currer, Ellis, and Acton Bell were chosen so as to give no clue to their sex), but met with no success. They then turned to fiction. Each wrote a novel. Charlotte's attempt, *The Professor*, was not accepted for publication, and she quickly wrote another, which is one of the world's masterpieces of fiction, *Jane Eyre*. So speedily was it written, and so immediately was its quality recognized that it was actually published earlier than the works of her sisters, which had been accepted. *Jane Eyre* was the big literary "sensation" of the year 1847. Emily died of consumption in 1848, and in the year following Anne was another victim of the same disease, though not before completing a second novel. Charlotte lived long enough to write two more novels, *Shirley* and *Villette*, and to marry in 1854. She died in childbirth the next year, and the extraordinary Brontë story was ended.

In her four novels (for *The Professor* was published after her death) Charlotte Brontë struck the first clear bell-note of English womanhood in fiction, describing love for the first time from the point of view of the average woman. Through the enforced self-suppression of her shadowed life there broke with astonishing energy and force the flow of passionate expression. *Jane Eyre* is essentially melodramatic in detail, but *Villette*, which is to a great extent autobiographical, shows high artistry in the faithful observation and sympathetic portrayal of character.

Emily Brontë's *Wuthering Heights*, her only novel, is one of the most extraordinary books ever written. No story could be more clumsy in its construction, more restricted in its range of scene and character, more slipshod in its phraseology. It seems to break all rules. Yet it is the product of a poetic imagination so powerful, so passionate, and so complete that all the rest is of no account. Normal critical standards are of no avail before such a conception. *Wuthering Heights* overrides them majestically, almost scornfully; and on completing it the reader is left with a sense of having seen visions—stimulating, horrifying, transcending reality, born of the wild elements breaking eternally across the wild moors, and reducing human beings to creatures no less elemental.

By comparison, the two novels of the youngest sister, *Agnes Grey* and *The Tenant of Wildfell Hall*, are of little account. But there is probably no more humanly moving story in the annals of literature than that of these three shy, quiet, humourless, and intensely courageous women, hidden away in the bleak and dismal surroundings of Haworth parsonage, transferring faithfully to paper their own strange and deep emotional and spiritual experiences for revelation to the world.

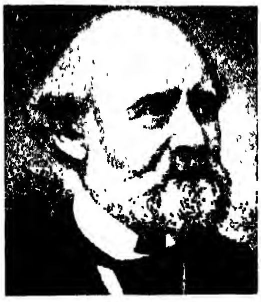
George Eliot (Marian Evans: 1819–80) was another great English woman novelist, though not at present receiving the attention she truly merits. She was an intellectual writer. With her the writing of fiction was the art of "thinking aloud," the novel was a vehicle for philosophy. But in the forefront of her philosophy—which, like Carlyle's, was centred upon devotion to duty—her characters stand out with lifelike fidelity. Her work is usually sincere and vigorous, but her genius flowered late, and some of her books have the effect of finished buildings from which not all the scaffolding has been removed.

Her scholastic attainments did not fetter her power of objective imagination. *Adam Bede*, *The Mill on the Floss*, *Silas Marner*, and

George Eliot

Mrs. Gaskell

Charles Kingsley



Charles Reade

Middlemarch (which some critics consider the most completely satisfying and truthful novel in the English language) are the works that best display her genius *Romola*, a story of the Italian Renaissance, will always have its admirers, for it displays scholarship and historical judgement of no ordinary kind. But it was brilliant task-work, and its author once declared that she was a young woman when she began the book and an old one when she finished. Her claim to recognition rests most firmly on her studies of lower middle-class life in town and countryside (particularly in the English Midlands), pictured with humour and vivacity, understanding and solidity.

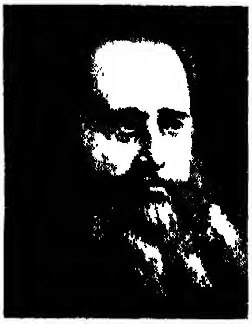
Yet another notable woman writer of the period, a Jane Austen with something of the warmth of Dickens (by whom she was considerably encouraged and influenced) and something of the power of Charlotte Brontë, whose friend and biographer she was, is **Elizabeth Cleghorn Gaskell** (1810 65). Her supreme achievement is *Cranford*, that exquisite picture of life and character in a small country town (Knutsford, in Cheshire), charming in its delicate humour and pathos. *Cranford* is pure artistry ; but Mrs. Gaskell was as ready as Dickens to write " with a purpose." Her first novel, *Mary Barton* (1848), is a passionate and powerful tale of the sorrows of the Manchester poor, and she returned to the same theme to some extent in her *North and South* (1855)

Charles Kingsley (1819 75) was a clergyman, and as a Christian Socialist and exponent of " muscular Christianity," a follower of Frederick Denison Maurice. These ideas found expression in two early novels, *Alton Locke* and *Yeast*, which can be counted among the many 19th-century novels inspired by a social purpose. He is, and will remain, more generally remembered for two fine, manly, historical romances, *Westward Ho !* and *Hereward the Wake*, and for two classics of literature for children, *The Heroes* and *The Water Babies*. In some ways his less famous brother **Henry Kingsley** (1830 76) was the more able novelist. His *Ravenshoe* is certainly a finer piece of romantic fiction, less avuncular, less didactic, than *Westward Ho !*

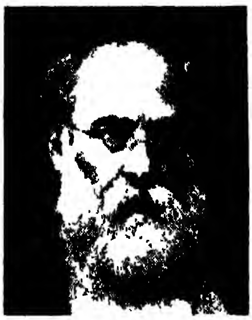
Yet another novelist who wrote " with a purpose " was **Charles Reade** (1814 84), who in various books set himself to attack prison scandals (*It is Never Too Late to Mend*), private lunatic asylums (*Hard Cash*), and " coffin ships " (*Foul Play*), besides giving a vivid picture of industrialism in *Put Yourself in His Place*. These books are little read to-day, but there has been no diminution in enthusiasm for his undoubted masterpiece, *The Cloister and the Hearth* (1861), generally regarded as one of the very finest historical novels ever written. It is a medieval romance—perhaps early Renaissance is a more accurate description of its period—like a huge, coloured tapestry with the whole of Europe as its scene. *The Cloister and the Hearth* is a book that can be read again and again and yet always offer something new, so vast is its range, so precisely drawn is its detail. The reader eager for exciting adventure, the young man or woman in love, the student of art, the student of social, religious, or military history, the moralist, the philosopher, the student of human action and conflict, and the simple reader who asks for no more than a well-constructed, well-balanced, and readable story—all are satisfied in these glowing pages.

Wilkie Collins (1824 89) learnt much from Dickens, even as Dickens learned much from him. He was one of the first writers to place the skilful construction of plot foremost among the duties of a novelist, and he invented and developed many new devices to this end which have since become commonplace, especially among writers of detective stories. Most of his novels suffer by his preoccupation with his own ingenuity in plot construction and, as a consequence, are all but forgotten. But at least two achieved so skilful a balance between plot-making and character-drawing that they are recognizably to be placed among the more important English novels. They are *The Woman in White* and *The Moonstone*. With such a predilection for plot, it was perhaps inevitable that Collins should write mystery stories. *The Woman in White* is one of the greatest in that class of fiction, to-day so familiar. Because of the confident touch with which his plot is constructed, Collins is able to make the wildest incredibilities credible and the sensational incident appear commonplace. He is a master of suspense, of queer atmosphere. The chief villain of *The Woman in White*, Count Fosco, is a creation beyond all the bounds of probability ; but there he is, firmly wedged into the plot, and therefore the reader is persuaded not only into acceptance of him but into very real hatred of him. As for *The Moonstone*, it has much the same quality, being dependent on the same main ingredient, and is also notable as being one of the earliest full-length English detective stories. It is interesting to note that Wilkie Collins was sufficiently a realist to allow his detective to fail.

George Borrow (1803-81) holds an important place among the Victorians, though he is a novelist only in the picaresque sense. The fictional device, as used in *Lavengro* and *The Romany Rye*, lacks the true fictional form, these books being no more than rambling


Wilkie Collins


George Borrow


Anthony Trollope


R. D. Blackmore

records of imaginary experiences ; in other words, they are fiction masquerading as true reminiscence. There exists a sort of cult of Borrow which glorifies the gypsy life, the foaming tankard, the swagger of vagabond scholarship, and the general there-is-wind-on-the-heath-brother attitude. One may have little sympathy with this and yet owe many happy hours to the company of George Borrow, an original and even inspiring personality.

Anthony Trollope (1815–82) was a post-office official who was nevertheless, and concurrently, a prolific novelist. He was an astonishingly methodical writer, who set himself to a strict routine of work—so many words per day—thereby turning himself into a highly profitable producing machine. It is scarcely to be wondered at that most of his fifty novels seem to have passed into oblivion ; the real wonder is that the survivors are so very good of their kind. His finest books, without any doubt, are the so-called Barsetshire novels—*The Warden*, *Barchester Towers*, *Doctor Thorne*, *Framley Parsonage*, *The Small House at Allington*, and *The Last Chronicle of Barset*. The same characters recur in the various stories, including one masterpiece of comedy characterisation, the redoubtable Mrs. Proudie, wife to the bishop of Barchester.

Between them the six books present a faithful picture of life in an English cathedral town and diocese of the 1850s and 1860s, faithful even in its dullness and in the trivialities of its human intercourse. There is no attempt at drama or the sensational. There is no discussion of problems ; although the basis is ecclesiastical, Trollope is interested in the various clergymen as very human men, and not at all in their theology. Thus, we do not learn whether or not the bishop was a good bishop, but we do get to know him very intimately as a henpecked husband. Young people fall very naturally in and out of love ; the middle-aged find themselves in plausible financial difficulties ; the old ones die ; and life goes quietly and evenly on. But the reader has time to make friends with all these characters. They are solidly, coolly, and sincerely portrayed, making their fullest effect by their likeness to real life.

This Lesson cannot be properly completed without mention of a few odd novels of the period, waifs and strays that do not fit easily into the general picture, yet are as worthy of inclusion as many of the works of the greater authors already mentioned. They include MRS. CRAIK'S *John Halifax, Gentleman* (1856), a classic of domestic fiction by reason of its sincerely wrought delineation of the development from boyhood to maturity of one who is a Christian gentleman without ever degenerating into a prig ; *John Inglesant* by JOHN HENRY SHORTHOUSE (1880), an historical romance (but also one of the most satisfying of all novels dealing generously with religion) about the early Jesuits and their opponents, "the religion of authority and the religion of the spirit" ; the various novels of BENJAMIN DISRAELI, later Earl of Beaconsfield, the bland masterpiece of historical romance by RICHARD DODDRIDGE BLACKMORE, *Lorna Doone* (1869), the only one of his 13 works of fiction either to achieve or to deserve permanent success, with its wonderful depiction of the rural scene on the verges of Exmoor and its admirable hero, the stalwart John Ridd, as fine a representative Englishman as ever figured in a novel ; and those two classics of fancy and logical nonsense in the form of stories for children, *Alice's Adventures in Wonderland* (1865) and *Through the Looking Glass* (1871), by LEWIS CARROLL (Charles Lutwidge Dodgson : 1832–98), books that have remained as fascinating to adults as to children.

LESSON 44

The Later Victorian Novelists

The reputation of **George Meredith** (1828–1909) as a novelist lies at the moment under something of a cloud. His highly civilized books are little read, and it is difficult to find the reason for this neglect, for in his lifetime he was hailed as a master-novelist and his "romantic comedies," as they have been called, were esteemed as great works. True, they are not easy to read, for his style is elaborate, his meaning often obscured. His sentences flow like a river with many tortuous deviations, demanding considerable skill in navigation on the reader's part. Nevertheless, every word compels attentive thought. Meredith was essentially too much of a poet, a lover of words and images, ever to be guilty of a trite or hackneyed phrase. Sooner or later, the river opens out into a reach of true nobility. At its best, his English is the best of his period, and anyway it is a poor sort of reader who dislikes exercising his mind. One would have thought that those who accept the challenge of contemporary poetry like that of T. S. Eliot would still take to their hearts the poetic, allusive prose of Meredith.

Moreover, Meredith was the first English writer to probe deeply into analysis of the motives, moods, and thoughts of his characters, to show thought transforming itself into will and intention, and thence into action. He was the first "subjective" novelist.

One of Meredith's particular achievements has been well stated by J. B. Priestley (in *The English Novel*, 1927):

> Another great gain in his fiction is his treatment of women and love. There is some good philosophy about women and love throughout his work, but in his best novels there is something better, namely, some great women characters and some great love scenes. Meredith's heroines ... are, perhaps, his greatest triumphs in the creation of character; they are worlds away from the sentimentalised dolls of most Victorian fiction. These women of his are so successful because they are definite individualities, playing their part, a very important one, in his comedy, and are yet highly poetical figures, for ever suggesting glamorous beauty. The whole treatment of sexual relations is at once frank and yet more truly romantic in Meredith's novels than it has been in any others of the century.

The greatest of Meredith's novels is *The Egoist* (1879), a masterly dissection of one particular trait in human character. Every honest man will recognize more than a little of himself in the central figure, Sir Willoughby Patterne, the egoist of the title. Other rewarding books, containing magnificent passages—those noble reaches already referred to—are *The Ordeal of Richard Feverel* (1859), *Beauchamp's Career* (1875), *Harry Richmond* (1871), and *Diana of the Crossways* (1885). Collectively they entitle Meredith to a much more prominent place in the story of the novel's development than contemporary critical opinion will allow him. The student of these Lessons should study the books and judge for himself.

Thomas Hardy (1840–1928) has already been considered as a poet (see Lesson 24). As a novelist he belongs entirely to the 19th century, for as a result of the storm of protest which greeted his *Jude the Obscure* in 1896 he deliberately confined himself thereafter to poetry—although in fact one more novel, *The Well-Beloved*, was published, but it had been written earlier than *Jude*. Hardy's novels, like his verse, are the vehicle of his peculiarly pessimistic philosophy. They present with remarkable consistency an intimate picture of the 19th-century rural England, or that part of it to which he gave the name Wessex (being the first writer to introduce that ancient term into modern literature), and especially Lower Wessex, i.e. Dorset, his native county. Yet over and above and pervading all the details of this picture is Hardy's equally consistent expression, through the localised scenes and characters, of his own views about the timeless universe. He sees all men and women as helpless creatures of circumstance and both heaven and earth as things malignant in their very indifference. Probably it is fair to call him the first of the English philosophical novelists.

His novels are curiously unequal. The essential Hardy can be found in the six "great" books: *Far from the Madding Crowd* (1874), *The Return of the Native* (1878), *The Mayor of Casterbridge* (1886), *The Woodlanders* (1887), *Tess of the D'Urbervilles* (1891), and *Jude the Obscure* (1896). To this list may be added his earliest published work, *Under the Greenwood Tree* (1872), in which the simple humours of rural life and rural love are unaffected by philosophical gloom, and *The Trumpet Major* (1880), a charming "period piece" set in Napoleonic times.

The "big six" are novels of tremendous dramatic power. The characters are conceived on the epic scale. Except in *Jude*, that vein of kindly compassionate humour which the author first exploited in *Under the Greenwood Tree* remains to sweeten the manipulations and machinations of black destiny. In the depicting of natural scenes—the earth, the clouds and the stars, sunshine and storm, trees, flowers, birds—Hardy is unexcelled. Indeed, it is undeniable that the closer he is to the natural elements the

more certainly flows his pen. His unsophisticated country folk are always handled with a surer touch than his squires and dames. He may chronicle a drawing-room conversation with stilted clumsiness, and a page or so later say something really memorable about a cart rut or a rabbit's fur.

With Hardy the English novel liberated itself to some extent from one particular convention which had put its shackles on even the most sincere and truthful of his predecessors, the convention of the happy ending. The traditional romance was expected to end with wedding bells, certainly with the confounding of vice and the final triumph of virtue. It is a tradition that dies hard to this day, and there may be sound and inescapable psychological reasons for the satisfaction which readers derive from it. That need of some sort of happy ending, even if it is not of the immediately obvious kind, may be a basic principle in the art of the novel. If that is so, it certainly cannot be claimed that the ending of *Tess* or of *Jude* is of a kind whose happiness is immediately obvious. As already stated, *Jude*, an excessively grim and painful story, aroused (and still arouses) hostility. But by his aggressive defiance of the old convention Hardy, like the French novelists of the Realist school, played his part in the emancipation of all future novelists, who can now at least pursue their path to a chosen end that does not conflict with the probabilities as they see them.

Robert Louis Stevenson (1850–94) has already been noted as a predominant influence in 19th-century prose. Many competent critics avow a warmer admiration for Stevenson the traveller, the essayist, the writer of short stories, than for Stevenson the novelist. Undoubtedly his finest writing is to be found in his short stories, his essays, and his travel books, and his main service to contemporary letters was concerned with style. Yet he was not without influence on the English novel, for he brought to it a new sense of form or shape. He also did much to revive the latent spirit of historical romance, in *Treasure Island*, *Kidnapped*, *Catriona*, *The Master of Ballantrae*, *St. Ives*, and *The Black Arrow*. He did not attempt to fill such great canvases as the genius of Scott could so easily crowd with unforgettable figures of romance. His was a smaller, more fastidious talent, but it prompted many later, if lesser, writers – Anthony Hope, Stanley Weyman, and many others – to keep the flame of romantic adventure brightly alive.

Samuel Butler (1835–1902) is possibly an over-rated writer, yet many writers, from Bernard Shaw downwards, have owed much to his ideas; indeed so far have they penetrated into the collective thought of the present century that it is difficult to realize how subversive they were in the writer's own period. *Erewhon* and *Erewhon Revisited* stand in the highest rank of that class of satiric fiction to which *Gulliver's Travels* belongs. The second is the finer work of art and contains the ripened conclusions of the author. Both books are attacks on the civilization of his day, presented with masterly ironic humour. His autobiographical novel, *The Way of All Flesh*, published after his death, is essentially rebellious in both matter and style, and is of relatively little importance.

The American-born **Henry James** (1843–1916) became an Englishman by adoption, living in England from early manhood and becoming a naturalised British citizen the year before his death. He was never a "popular" novelist, but he became a cult, and through two generations the ability to admire Henry James was considered a touchstone of literary percipience. His novels include *Roderick Hudson* (1875), *Daisy Miller* (1878), *Washington Square* (1880), *The Bostonians* (1886), *The Tragic Muse* (1890), *What Maisie Knew* (1897), *The Turn of the Screw* (1898), *The Awkward Age* (1899), *The Wings of a Dove* (1902), and *The Ambassadors* (1903). James, more consistently "subjective" in the treatment of his characters than even Meredith was, is unsurpassed in the minute and subtle analysis of human motives and behaviour and in


George Meredith


Samuel Butler


Henry James


George Gissing

the delineation of the contrast between American culture and that of the older countries. He was pre-eminently a stylist, fastidious in his selection of words to convey a given shade of significance in relation to their context. This fastidiousness tended to become a mannerism, lending itself to easy parody, and irritating in its literary self-consciousness to those who care more for what a writer has to say than for the way he says it ; yet it undoubtedly exercised considerable influence on other writers. He was one who followed such French novelists as Flaubert, the de Goncourts, and de Maupassant in endeavouring to discipline the novel to the level of "art for art's sake."

J. B. Priestley has written of Henry James :

> He made comedy and tragedy out of shades and flickers of thought and feeling. His people themselves and the whole life he describes are sophisticated, self conscious, introspective, subtle, and the narrators that present these people and comment on this life are compelled to exhibit a still more sophisticated and subtle intelligence. He has to make art out of people who have already turned life itself into an art. Thus he seems the most studiously artificial of all novelists, one who admits us into a world of smiling or tortured ghosts.

Another fastidious artist, also influenced by the French, was the Irishman **George Moore** (1852-1933). As a young man he studied painting in Paris for some years, as a disciple of the Impressionist school. His *Esther Waters* (1894) is an admirable adaptation to the English scene of the tenets of the French Realist school of novelists. Later he became for a time an exponent of the Celtic Revival, and his short stories of Irish character published under the title of *The Untilled Field* are among his finest writings. Finally he produced novels like *The Lake* and *The Brook Kerith*, in which the beauty of his style induce a mood of gentle reverie.

Yet another French-inspired "realist" was **George Gissing** (1857-1903), though the inspiration was realized in Zola-esque choice of subject rather than in his manner of treatment. For he wrote of sordid slums and poverty and distress and despair, the sombre side of city life in the later 19th century ; and he did not disguise his own hatred and anger and bitterness at the existence of the dingy evils he depicts, and among which he had been thrust by the cruel circumstances of his own life. *The Nether World, New Grub Street, Odd Women, Born in Exile*—these novels, despite the admirable grace of their prose, are not entertaining books, nor were they intended to be ; but they are undoubtedly impressive. Later, in more comfortable surroundings, he was able to pen a genuine masterpiece, which is likely to be read when the rest is forgotten, *The Private Papers of Henry Ryecroft*, a thinly veiled autobiography in the form of fiction, and a remarkable human document.

This Lesson, like the previous one, has passed under survey only those writers of the period who are in one way or another historically important for their influence on the evolution of the English novel. There were other writers, a host of them, many of whom were admirable travellers along the path that greater ones had blazed for them ; but, much as one might like to linger with them, they are beyond our present scope.

At the beginning of the Victorian age the novel was a free-and-easy, virtually formless medium for the exuberance of individual genius as exemplified in *The Pickwick Papers*, a glorious piece of robust literary skylarking. During sixty years it was schooled and trimmed and refined into a self-conscious and intelligent art-form. It had discarded such loose conventions as it had inherited, but only in favour of conventions, closely argued and rigidly applied, which made far stricter demands upon the writer. Is it possible that the process was to become increasingly detrimental to the expression of exuberant genius ? Some would say so.

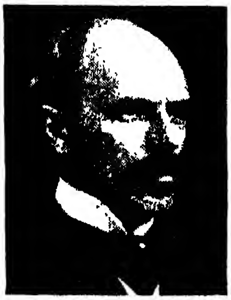
LESSON 45

At the Turn of the Century

THE wide extension of popular education in Great Britain produced a huge new reading public ; and what that public wanted most of all was fiction. To millions of people for several decades the word "book" was synonymous only with the word "novel." Their demand was met in several ways. There has never been such a sudden spate of English fiction, good, bad, and indifferent, as there was in the 1890s and the early 1900s.

The majority of the new readers were not people of leisure, and the three-volume novel went swiftly out of favour. It has never returned, except as a very occasional freak ; H. G. Wells, for example, published *The World of William Clissold* as a three-decker in 1926, but he did not repeat the experiment. It was replaced at the turn of the century by the single volume of between 60,000 and 80,000 words, originally priced at six shillings. Though the price has, of course, been increased, this is the format which the 20th century has now generally associated with the English novel—or, at least, with the newly published novel, for reprints

Sir H. Rider Haggard



Maurice Hewlett

Anthony Hope

Sir A. Conan Doyle

take many forms—for over fifty years. During the 1930s, following the immense success of J. B. Priestley's huge books *The Good Companions* and *Angel Pavement*, there was a tendency to revert to greater length, perhaps to as much as 200,000 words (though all within a single volume). After the Second World War, the economics of publishing reversed this tendency very definitely. Meanwhile those novelists who missed that opportunity for the fullest development of characters and theme which the "three-decker" had given their predecessors soon took refuge in the device of the "trilogy"—a series of three separate single-volume novels, each one self-contained, yet all interrelated by theme or characters. Eventually the most successful of such trilogies were themselves published as single volumes, as was done with John Galsworthy's three novels forming *The Forsyte Saga*.

Lending Libraries and Magazines

The bulk of single-volume novels in the early years of the 20th century might be called "circulating library" novels. The new public was essentially a library public, either subscribing to a private circulating library or borrowing from one of the many new free public libraries.

In other words their habit was to borrow books rather than to buy them, except in the case of cheap reprints; and as the novels were swiftly read and constantly exchanged, there grew a consistent demand for sheer quantity. Inevitably most of these novels were ephemeral. A great deal of craftsmanship went into their writing, but they were never meant to be more than opiates—romantic love stories set in various climes and periods, sentimental or humorous pictures of rustic or suburban domesticity, plain stories of the sea or adventure, pleasant sermonising, attractive slices of high life, all intended as nothing more serious than the entertainment of an hour. Their craft consisted, above everything, in story-telling.

Another response to the demand of the new reading public was seen in the innumerable popular magazines which sprang up in the 1890s and the early years of the 20th century, culminating in the all-story magazine, which printed nothing but fiction. The serial story, later to be published as a novel, was an early and persistent feature of these magazines, but their chief contribution to the art of fiction was the ready means they provided for the development of the short story.

In the hands of the French writer, Guy de Maupassant, the short story had also become an art-form, with rules differing in several respects from that of the novel. It is interesting to note that the early volumes of the *Strand Magazine*, which first appeared in 1891, had to fall back over and over again on translations of foreign short stories in order to fill their pages devoted to fiction. But it was not long before this particular form of fiction found several masterly, and indeed distinguished, native exponents. Robert Louis Stevenson was one of the very earliest and greatest of them. The turn of the century was indeed the heyday of the English short story. Most of the eminent writers of fiction still to be named in these Lessons were practitioners of both novel and short story. Some were pre-eminently masters of the short story, who also wrote novels; others were pre-eminently novelists, who could also write good short stories. Such distinctions will be duly recorded in each case.

Surveying, then, the opening of the 20th century, one finds the great Victorians either vanished from the scene or on the point of vanishing, and no one quite ready to step into their places and to dominate as they did. The new century inherited from the 1890s a number of first-rate "story-tellers." Here are some of the best of them:

Lucas Malet (Mrs. St. Leger Harrison: 1852-1931), a daughter of Charles Kingsley, and author of such powerful books as *The Wages of Sin* and *Sir Richard Calmody*.

William Clark Russell (1844-1911), a sailor for seven years, whose reputation as a writer of sea stories with the genuine salt tang was founded on *The Wreck of the "Grosvenor."*

Sir Henry Rider Haggard (1856-1925), who wrote stories of romantic adventure in the African interior, including *King Solomon's Mines* (1885), *She* (1887), *Jess* (1887), *Alan Quatermain* (1887), *Nada the Lily* (1892,) *Montezuma's Daughter* (1894).

Maurice Hewlett (1861-1923), a literary artist of rare distinction, who, in addition to stylish essays and some verses of rare beauty, wrote *The Forest Lovers* (1898), a romance in the vein of nebulous medievalism usually ascribed to the influence of William Morris, and later followed with other finely wrought romances such as *Richard Yea and Nay*, *The Queen's Quair*, and *A Lover's Tale*.

Stanley John Weyman (1855-1928), a writer of historical romances, notably *A Gentleman of France* (1893), *Under the Red Robe* (1894), *The Red Cockade* (1895).

Anthony Hope (Sir Anthony Hope Hawkins: 1863-1933), in whose two stimulating Ruritanian romances, *The Prisoner of Zenda* (1894) and *Rupert of Hentzau* (1898), the influence of Stevenson is clear, but whose other writings are of less concern.

Henry Seton Marriman (Hugh Stowell Scott: 1862-1903), who successfully combined romance and realism in such popular stories as *The Sowers* and *Barlasch of the Guard*.

"**Q**" (Sir Arthur Quiller-Couch: 1862-1944) already noted in this Course as a distinguished critic, who also wrote novels of widely different types, but usually concerned with his native Cornwall, as are *Dead Man's Rock* (1887), *The Astonishing History of Troy Town* (1888), and *The Delectable Duchy* (1893).

Sir Arthur Conan Doyle (1859-1930), whose short and long stories about his immortal Sherlock Holmes have been too readily allowed to overshadow other possibly finer and distinctly masculine works such as the three historical books, *Micah Clarke* (1888), *The White Company* (1890), and *Rodney Stone* (1896), as well as such well written adventure stories as *The Tragedy of the Korosko* (1898).

James Matthew (later **Sir James**) **Barrie** (1860-1937), writer of sentimental stories and sketches of humble Scottish life but he was about to forsake fiction for playwriting, as Hardy had already forsaken it for poetry.

Many might expect to find that a list of the great story-tellers of this particular period would also include the name of **Sir Hall Caine** (1853-1931) He himself would no doubt have expected it to be there. His is a peculiar case, for though he achieved a popularity with the multitude far outstripping that of any of those already mentioned, and was not only a born story-teller but a most assiduous novelist, his novels are too flamboyant and highly-coloured, and his choice of themes too grandiose in conception and treatment, for him to be taken as a serious literary figure. There is a certain value in the Manx scenes and characters depicted in *The Deemster*, *The Bondman*, *The Scapegoat*, and *The Manxman*; but, in the words of Oscar Wilde, he always wrote "at the top of his voice," and never more stridently than in *The Christian*, *The Eternal City*, *The Prodigal Son*, and (later) *The White Prophet*, and *The Woman Thou Gavest Me*. He went on writing at the top of his voice, to his great material advantage, to the end of his life, when he was engaged on a huge and prolix Life of Christ. Nevertheless, at the turn of the century, he was taken seriously, and by nobody more than the patrons of the circulating libraries; and at least he may be given higher rank than his fellow-moralist and rival in sensationalism, **Marie Corelli** (1864-1924), author of *The Sorrows of Satan*, *The Mighty Atom*, *The Master Christian*, and *God's Good Man*, and other notoriously uninspired stories, purporting to be "advanced"

Other good story-writers were at that time on the verge of establishing such reputations as the early years of the 20th century were to confirm. They include **W. J. Locke** (1863-1948) and **W. B. Maxwell** (1876-1938). **William Wymark Jacobs** (1863-1943) was a humorist of deliberately restricted range, but nevertheless an untiring and genuinely creative artist, especially in short stories of longshoremen and seamen on small coasting vessels and similar humble folk. Another humorous and sympathetic observer of lower middle-class life in London was **William Pett Ridge** (1860-1930). **Eden Phillpotts** (b. 1862), produced a "Dartmoor cycle" of twenty novels, covering every part of that geographical region.

These, one repeats, were among the best of the "story-tellers," and gifted writers all. But where were those writers who could be something more, as their great predecessors had been, who could leave upon the art of fiction, as their great predecessors had done, the permanent impress of strong personality? Which of the story-tellers would reveal a deeper purpose than the provision of an hour's easy entertainment for tired readers?

One such had already soared to extraordinary heights of fame and popularity during the last decade of the 19th century—Rudyard Kipling; and before the new century had advanced very far, five other writers who had clearly shown themselves to be something more than mere story-tellers began to share domination—Conrad, Wells, Bennett, Galsworthy, and (to a somewhat slighter degree and in a different way) Chesterton. These six are considered separately in the next Lesson.

LESSON 46

Six Leading 20th-century Novelists

THE verse of **Rudyard Kipling** (1865–1936) has already been noticed in our Lessons dealing with English poetry (Lesson 24). The greater part of his fiction consisted of short stories, which achieved more permanent form when collected into volumes, with titles that quickly became familiar: *Plain Tales from the Hills* (1887), *Soldiers Three* (1888), *Wee Willie Winkie* (1889), *Life's Handicap* (1890), *Many Inventions* (1893), *The Day's Work* (1898), *Traffics and Discoveries* (1904), *Actions and Reactions* (1909), *A Diversity of Creatures* (1917), *Debits and Credits* (1926), *Limits and Renewals* (1932). There are also *The Jungle Book* (1894) and *The Second Jungle Book* (1895), collections of animal stories; *Stalky and Co.* (connected short stories about school life, 1899); *Just So Stories* (for little children, 1902); *Puck of Pook's Hill* (stories of English history, for children, 1908) and a companion volume, *Rewards and Fairies* (1910). Longer stories were *Captains Courageous* (1897), a story of fishermen on the Grand Banks, and *Kim* (1901), a tale of adventure among the people of India; but Kipling's only novel, in what had now become the accepted sense of the term, was *The Light that Failed* (1891).

Kipling was born in India, and worked there as a journalist for seven years. His earliest tales were both written and originally published there, and have an Indian setting. Later he sought new scenes, first in the U.S.A., then (having settled in England) found lasting inspiration in his love of England, and of the English soil as a palimpsest of history. He was a superb literary craftsman, with a style so individual and so consistent that there is little, apart from choice of subject, to distinguish a story written at the outset of his brilliant career from one written in 1930, though the authorship of each would be unmistakable. He never wasted a word, and if he could make one word do the work of two or more he always preferred it, so that few writers have ever created such a vivid impression more economically, or said so much so briefly.

Great and conscientious craftsman and gifted story-teller though he was, he was also a man with a deeper purpose. Some have disliked or misunderstood the purpose. His interest in the British soldier, his early support of the principle of national military service, his idealisation of the British Empire have offended them. Certainly he was an enthusiastic Imperialist, who never possessed more admirers than during the boastful Imperialist decade which preceded the disillusionment of the South African War. He, too, became disillusioned; but he never ceased to use his stories as a means of displaying his admiration for those ideals of loyalty, courage, self-discipline, and service which inspired the servants of the Empire, civil and military, in every part of the world.

His popularity as a writer waned increasingly in later years. Much personal sadness came to him, and his later stories are more and more concerned with obscure diseases, mental and physical, probably in reflection of his own thoughts about himself—though at the same time they strike a note of human compassion deeper than can be discerned in many of his earlier writings. If, generally speaking, the characters he created are types rather than individuals, they are types that Kipling knew as intimately as the greatest writers know their characters and therefore have the rare merit of being consistently and remarkably true to their kind.

The original name of **Joseph Conrad** (1857–1924) was Theodor Jozef Konrad Korzeniowski. He was a Pole, who became a naturalised British citizen in 1886. Knowing no word of English, he had joined the British mercantile marine some eight years earlier, and had become a master mariner. He remained a deep-water seaman until 1894, when he caught a fever. During convalescence he wrote, in English, his first novel *Almayer's Folly*. Not only did he display a remarkable mastery of English, but also such a discriminating style of writing as to appeal at once to the discerning reader. Other powerful stories of the sea were *The Nigger of the Narcissus* (1897), *Lord Jim* (1900), *Youth* (1902), *Typhoon* (1903), and *Nostromo* (1904). Later he widened his range of material with *The Secret Agent* (1907), *Chance* (1914), *Victory* (1915), and other fine novels.

His English was rich and characteristic, but he never seemed quite to acquire the English habit of mind. Possibly the secret of his charm lies partly in some subtle exoticism. But it also lies more clearly in that philosophy of loyalty which runs through his work like a thread; in his recurrent themes of the universal brotherhood of the sea and the eventual integrity of human relationship; in his appeal to the heart of a seafaring people by his powerful expression of the sea's terror and fascination. All who begin to read him, in however critical a mood, are soon held by his powers of descriptive narrative and psychological penetration; by his strange mixture of the painful and the beautiful, the squalid and the noble; by the power, in which he particularly excelled, to create atmosphere and

emotional tension. He was also a satisfying writer of short stories.

With the name of **H. G. Wells** (1866 1946) we come to a giant figure who was himself a product of the same process that had created the new and immense reading public. He was undoubtedly a "son of the people," son of a professional cricketer and a mother who had been, and was again to be, in domestic service. Wells was apprenticed to a draper in his early youth, then became a pupil teacher, then a student of science. During the next fifty years he became one of the most internationally famous and respected men of his generation, and the most prolific and influential English writer since Dickens. So far as his fiction was concerned—and it was fiction that first brought him to public notice—he owed his success entirely to an unusually logical mind and remarkable gift of imagination, combined with an exuberant sense of humour, a combination which made him the most readable of writers, appealing to every kind of reader, "highbrow" and "lowbrow" alike.

Most of Wells's earliest stories were romances exploiting the possibilities of scientific discovery and development. He wrote of visits to the distant future, of men who could make themselves invisible (by science, not by magic), of men who visited the moon, of a Martian invasion of the earth, and of a food that turned men into giants; and was able to develop such themes more logically and credibly than anyone could have imagined. In his early period, too, he wrote some of the finest short stories in the language, though this was a form he deserted all too soon.

Wells, like Kipling, soon proved to be a "man with a message," though no two messages could have been at more opposite extremes. Having looked logically into the future in considerable detail in his romances, he was readily accepted as a prophet in the wider sense as well. As stated in Lesson 35, in all his writing, fiction and non-fictional alike, one constant theme appears the conscious shaping of the future by mankind, and the possibility of a fuller, happier, and saner social order based on a collective will; and his constant purpose in writing was to stimulate and re-direct human thought towards such an order. His later "scientific romances," such as *In the Days of the Comet* and *Men Like Gods*, were written with this purpose very much in mind. Early novels—as distinct from the romances—like *Kipps* (1905) and *The History of Mr. Polly* (1910), though presented as exuberant entertainment, and unrivalled (apart from Dickens) in sympathetic depiction of the humours of humble people, convey more than a hint of an urgent socio-political purpose, which was to be developed in a long series of later novels, beginning with *Tono-Bungay* (1909) and continuing almost to Wells's death nearly forty years later.

There is no necessity to name these novels individually. Each was a brilliant re-statement of the Wells thesis. Their author made no claim for immortality for any of them. He disclaimed any title to be an artist, preferring to be remembered as a great journalist, writing urgently for his own day. Thus, the later novels are increasingly symbolic and didactic. He used all the traditional devices of fiction—characters, descriptive scene, dialogue, humour, touches of sentiment, touches of undeniable beauty, action and reaction, dramatic climax as an instrument of propaganda; and he used them brilliantly, except that he was too often constrained to introduce some talkative character who was ready to turn promising dialogue into a harangue. In doing all this, he exercised an enormous influence on the shape of the English novel. He soon found that the idea of the novel as an art-form, as derived from Flaubert, was useless for his purpose, and he returned to the looser, more discursive form of an earlier day. His novels disregarded all the rules of careful plot-construction; but where the old novels had rambled, Wells showed novelists how to dart swiftly from point to point with something of the effect of a series of film shots, usually breaking up even his chapters into smaller, numbered "sections," a new technical device that has since been much copied. A later novelist, Aldous Huxley, has put on record how much he and other novelists owed to Wells through his adaptation of the technique of fiction in all sorts of unexpected and unconventional ways to suit an immediate purpose.

It should also be mentioned that Wells boldly broke through other conventions besides those of technique. He was the first important writer to deal outspokenly with problems of sex relationship. At least three of his novels were banned by various public libraries—*Tono Bungay*, *Ann Veronica* (1909), and *The New Machiavelli* (1911). His example in this respect was followed, for better or worse, by even more novelists, to such an extent that those three novels were soon made to look almost prudish. It would indeed puzzle any contemporary reader of them, coming upon them for the first time, to discover exactly where the cause of offence lay. It is also fair to add that in outspokenness Wells himself soon left those three novels far behind.

Those who wish to make an acquaintance with Wells as a serious novelist will find all that is most characteristic in *Kipps*; in *Mr. Britling Sees It Through* (1916), which also has the merit of being an excellent documentary picture of English life in the early days of the First World War; and possibly in *The Dream* (1926). But

they should also read some of the "romances," such as *The Invisible Man* and *The Food of the Gods*; and those two wonderful short stories, *The Star* and *The Man Who Could Work Miracles*.

The names of H. G. Wells and **Arnold Bennett** (1867–1931) were often bracketed in common conversation during their lifetimes, as those of Dickens and Thackeray had been earlier. They really had little in common, except that they were almost the same age, were personal friends, were both of middle-class stock, and were both prolific in various forms of literature and journalism. Bennett was the product of a secondary school in the Potteries, and had been a clerk in a solicitor's office there before moving to London with the determined ambition to succeed as a writer. He undertook a conscientious self-education in the art, modelling himself upon the later French novelists, especially the brothers de Goncourt.

Where Bennett differs from Wells is in his conception of the novelist's function. Bennett was not conscious of fulfilling any mission, except that of being a creative artist in prose and, if possible, making money by it. In his novels he accepts the world of people and things exactly as it is, as so much subject matter, and indeed takes delight and expresses delight in every aspect of that world that comes under his shrewd and extraordinarily detailed observation. Continually he is re-discovering the essential marvel of the commonplace—of commonplace people, commonplace actions, commonplace material surroundings. It was his peculiar gift to reveal that marvel to his many readers.

His masterpiece, *The Old Wives' Tale* (1908), is one of the really great English novels, fit to rank with *Vanity Fair*, *David Copperfield*, and *The Egoist*; yet it is mostly compiled from the very simplest materials. Ranking only just below it is *Clayhanger* (1910), first of a trilogy of which the other two novels are *Hilda Lessways* and *These Twain*, a trilogy that did not quite succeed artistically because the first book was so incomparably the best. These three books, and much of *The Old Wives' Tale*, are set amid the smoky, humdrum, provincial streets of his native Staffordshire pottery district, which he called the "Five Towns"; and he wrote several other fine stories, long and short, about the people of the Five Towns and their ways—notably *Anna of the Five Towns* and *Whom God Hath Joined*. Later he widened his range. From among his later novels, *Riceyman Steps* (1923), a moving tale of life in the mean streets of Clerkenwell, stands pre-eminent in its character-drawing, atmosphere, humour, sympathy, and narrative power. Two other minor masterpieces, light-hearted, original, entertaining, are *Buried Alive* (1908) and *The Card* (1911). But there is a ripple of good humour in everything he wrote. His influence upon younger novelists was stimulating.

It remains debatable whether **John Galsworthy** (1867–1933) illuminates the pages of literary history the more as novelist or as dramatist. In Lesson 38 something is written of the chief quality of his plays, an expression of that imperturbable fair-mindedness which shows itself well aware of both sides of an arguable case, moral or social, only to add weight eventually to the side most in need of human sympathy, the losing side, the side of the under-dog. That same quality is evident throughout his fiction, both in his long novels and in his many delightful short stories.

It is characteristic that in the long series of novels that constitute his two great trilogies, *The Forsyte Saga* and *A Modern Comedy*—and these represent his major work as a novelist—he began by disliking his own central character, Soames Forsyte, and seeking to make his readers dislike him; but as this made Soames the "under-dog," Galsworthy inevitably began to discern that there was something to be said for him, and, as novel succeeds novel, the character is gradually transformed from an object of contempt first to an object of good-natured ridicule, then to one of pity, and finally he became one of the most likeable characters in English fiction, commanding almost the same kind of affection as Thackeray's Colonel Newcome. Thus, with an air of striking a judicial balance, Galsworthy, as so often, tips the balance in the direction of human kindliness.

He took his work as a novelist with the utmost seriousness, as one with a sense of responsibility for the possible influence of what he wrote. *The Forsyte Saga* and *A Modern Comedy* consist of six novels and four linking short stories. Between them they present not only a wonderful portrait gallery of characters, built up with great care and infinite understanding, but also a well-documented picture of English social life from the 1880s to the 1920s. The Forsyte family and their connexions are very real, individual people; but they are also symbolic representative figures of a vanished era, the heyday of the prosperous upper-middle class in English society. The first novel in the series, *A Man of Property*, appeared in 1906; the last, *Swan Song*, in 1928. Here was a novelist who attempted and achieved, as Balzac did, a life-work on a major scale.

Gilbert Keith Chesterton (1874–1936) stands apart from these others, for he used the form of the novel purely as a medium for ebullient philosophical fantasy. Yet *The Napoleon of Notting Hill* (1904), *The Man Who Was*

Thursday (1907), *Manalive* (1912), and *The Flying Inn* (1914), for all their boisterous humour and the sheer incredibility of the events they purport to describe, still command respect from all who are interested in the possibilities of fiction. Each sets out to establish a philosophical point and succeeds in its aim all the more forcibly because an amusing story is told, however incredible it may be. They are, indeed, fables, and of the most attractive kind, philosophic pilules covered with rare jam. *The Club of Queer Trades* is a collection of bizarre short stories in the vein of Stevenson's *New Arabian Nights*, and affords a good instance of Chesterton's genius for recognizing, like Arnold Bennett, the latest possibilities of romance in everyday people and places; though Bennett penetrated to the romance that was already there, while Chesterton invented his own and superimposed it. With his famous character Father Brown, priest and detective, who first appeared in 1911 and was the chief figure in many excellent short stories, Chesterton lifted the detective story to a higher intellectual plane than it had reached before and has rarely touched since. The novels written by Chesterton in collaboration with his friend Hilaire Belloc (see Lesson 24) were satirical *jeux d'esprit*, not to be regarded too seriously. Belloc on his own wrote one or two satirical novels about corrupt politics and shady finance, so subtle in their irony that many innocent readers may fail to detect it, and, taking the work as straightforward fiction, wonder why the author has taken the trouble to write, so ordinary does the story seem to them.

LESSON 47

The English Novel since 1918

During the period between the two World Wars, English novel-writing in general not only sustained a high level of competence, but also appeared to have struck a comfortable enough balance between the necessity of telling some sort of story and the desire to do something more. The pure story, so popular in the earlier years of the century, went swiftly out of vogue. Romance and sentiment appeared to be dead. Little attention was given to any kind of poetic beauty and "art for art's sake" was no longer a creed. An increasing number of readers began to look for that "something more" than a story; the novelists, for their part, were anxious to give it to them.

Psychology and Sex

There crept into literary criticism the word "significant." A serious novel was now expected to "signify" something on the part of the novelist a particular point of view, a theory of life, a philosophic mood, and above all, an awareness of psychology. In the creation of his characters the novelist became much less interested in depicting their outward characteristics than in attempting to analyse, record, and interpret their inmost thoughts and feelings What the people in a story thought or felt tended to be more important than what they said or did. In short, the novel became at once more "intellectual" and more subjective. Writers may have written at length about the emotions, but they strove with great conscientiousness to do so unemotionally.

Moreover, as the current trend in psychology was based on the theories of Freud, it was almost inevitable that the novelists began to lay emphasis on problems of sexual desires and sexual relationships. The greater freedom allowed in the presentation of such themes was assisted to some extent by the general loosening of inhibitions that followed the First World War A large and important aspect of human experience was no longer to be excluded from action by moral taboo. Rejoicing in this freedom, many novelists soon appeared unduly preoccupied not only with the problems but also with the physical details of sexual relationship, very much at the expense of their art. The habit became wearisome, even to the most sophisticated reader For a time it seemed that every hero and heroine must necessarily be an adulterer or adulteress. The best writers relegated the new freedom to its proper place as an advantage enabling them to offer a more complete picture of human life than had been allowed to their immediate predecessors.

Special Developments

Three phenomena of the period demand special mention The first is the unusual number of highly competent women writers, to whom this hard "intellectual" approach seems to have been ideally suited. The second is the extraordinary vogue between 1928 and 1931 of novels about the First World War, a vogue that owed much in its origin to the popular acclaim given to the translation of a German novel by Erich Remarque, *All Quiet on the Western Front*. For a time it seemed that every writer of any repute, as well as many of no repute, was scurrying to publish in the form of fiction his own particular experience of war, often couched in the bitterest terms and sparing the reader little in the way of grisly realism. Then the

vogue suddenly died as swiftly as it had been born. Some of the most enduring fictional records of the war were written before that period—such novels as *The Secret Battle*, by A. P. Herbert, and *The Spanish Farm*, by R. H. Mottram ; of those published during the vogue at least H. M. Tomlinson's *All Our Yesterdays* and Henry Williamson's *Patriot's Progress* were acceptable contributions to this particular branch of fiction.

Finally, it may be noted how the perpetual desire for romance and a " good story," which persists even among intellectual readers, was successfully canalised during this period by a cultivation of the " thriller " and the detective story. The two are closely allied, for each presents a purely romantic conception of the world, each is more concerned with the development of incident or plot than with the development of character, and each exploits the traditional happy ending, with virtue triumphant and villainy subdued. The stories of that astonishingly prolific writer **Edgar Wallace** (1875-1932) usually combined thrills with the detective interest. In the hands of many later writers Dorothy L. Sayers and Agatha Christie, for example the detective story developed its own strict conventions, owing much to the jig-saw puzzle plot-construction of Wilkie Collins, to the deductive methods used by the master-detective Sherlock Holmes in stories by Conan Doyle, and to the more philosophical approach to the solution of mysteries adopted by Chesterton's Father Brown. At its best the detective story has become divorced from the thriller. There may still be a corpse in the library, but it is devoid of horror ; it is not so much a dead body as the central ingredient in a skilled intellectual game.

For much of the period, Wells, Bennett, and Galsworthy were still the dominating figures. Though Kipling published further occasional volumes of short stories, he was no longer held in esteem by the leading literary arbiters of the day (yet thousands of people still read and enjoyed him). More in tune with the temper of the time was **David Herbert Lawrence** (1885-1930), son of a Nottinghamshire coal-miner, whose range as a novelist was limited by intense pathological obsessions, which led him to concentrate on such themes as mother love, thwarted passion, and enmity between the sexes. The autobiographical novel which made his reputation, *Sons and Lovers*, was published in 1913, and contains a vivid psychological portrait of his own mother. No other of his novels came up to the high standard he set himself in this, his second book, though all were above the average, and clearly the product of a powerful, though restless, wayward, and rebellious intellect. The notorious *Lady Chatterley's Lover* was published in Florence in 1928, but was banned in the United Kingdom, except in expurgated form. It has little or nothing to commend it. It is inspired by a more pretentiously literary form of the urge that impels small boys to chalk forbidden words on walls.

Attuned to the age in another way was the hard, mordant cynicism of **William Somerset Maugham** (b. 1874), expressed with impeccable craftsmanship and informed with a wit that is uncompromising and often biting. He also wrote brilliant short stories, somewhat in the manner of de Maupassant.

Sir Hugh Walpole (1884-1941) was another who had begun his career as a novelist before 1914, but brought it to fulfilment between the wars. Many of his novels carry a suggestion of symbolism, and he was much attracted by whatever was lurid and fantastic, especially in the psychology of his characters. His finest achievement was *The Herries Chronicle* (1930-33), a series of connected novels dealing with one family from the 17th century to the 20th, though many prefer a short masterpiece of psychological observation, *Mr. Perrin and Mr. Traill*, published as early as 1911.

A more straightforward writer, and at his best a conscientious artist, is **Frank Swinnerton** (b. 1874), whose *Nocturne* was greatly admired

Joseph Conrad

D. H. Lawrence

Sir Hugh Walpole

John Buchan

by both Wells and Bennett. **Sir Compton Mackenzie** (b. 1883) produced many novels of varying importance. He achieved early popular success with *Sinister Street* (1913) and its several sequels. His most ambitious work was a cycle of six novels called *The Four Winds of Love* (1937-45). **John Buchan** (1st Lord Tweedsmuir: 1875-1940) kept the flag of Stevensonian romance bravely flying with his tales of exciting adventure, *The Thirty-nine Steps*, *Greenmantle*, *Mr. Standfast*, *The Three Hostages*, *The Dancing Floor*, *The Island of Sheep*, and many others. **Edward Morgan Foster** (b. 1879), who had written before the war two distinguished novels in *A Room with a View* (1908) and *Howard's End* (1910), touched greatness with *A Passage to India* (1924). He was a careful, supremely conscientious writer, who produced nothing that was not truly expressive of his own view of life and human nature.

Prominent amid the new post-war generation of novelists was **Aldous Huxley** (b. 1894). His early novels suggest the attitude of mind of the undergraduate setting out to shock his elders. They were studies in morbidity and decadence, which took full advantage of that new freedom which permitted writers to describe such scenes and record such conversations as had never been recorded and described in the previous century. They can scarcely be taken seriously as novels, though their satiric wit is often brilliant and the writing obviously that of one who would discover more important things to say. *Point Counter Point* (1928) is a more sustained study. It still presents the more corrupt and unpleasant aspects of human nature, but soberly and, as it were, scientifically, rather than gleefully. Huxley ensures his fashionable aloofness from sentiment by deliberately assuming, as befits the grandson of Thomas Henry Huxley, the outlook of the scientist, expressing in quasi-scientific terms that interplay of cause and effect which is the substance of every novel. It was an original device, much copied by less capable writers. His *Brave New World* (1932) is, however, a satire on scientific "progress," unforgettable for the cold fury of its style.

Another effective satirical novelist in the modern style is **Evelyn Waugh** (b. 1903). His earliest stories, *Decline and Fall* (1928) and *Vile Bodies* (1930), were little more than amusing burlesques, but later he revealed strong emotional power, adeptly controlled, and more than a little psychological insight. In other words, the satire in his stories, always superficially amusing, is more profound than at first appears.

Robert Graves (b. 1895), who made his first reputation as a poet, produced some scholarly reconstructions of Roman history in *I, Claudius*, *Claudius the God*, and *Count Belisarius*. **Virginia Woolf** (1882-1949) made several bold experiments in technique with undoubted effect in *Jacob's Room*, *Mrs. Dalloway*, *To the Lighthouse*, and *Orlando*. Mention should be made, too, of the witty commentary on contemporary manners in the novels of **Rose Macaulay**, especially *Potterism*, *Dangerous Ages*, and *Told by an Idiot*.

Writers of originality, less easy to classify, include **Algernon Blackwood** (1869-1951), a writer of beautifully conceived tales of the supernatural and the mystical; **Claude Houghton**, whose most characteristic work, however closely concerned with the depicting of real men and women, is shot with a provocative fantasy that compels attention; and (by way of contrast) **Pelham Grenville Wodehouse** (b. 1881), a humorist whose delightful characters inhabit a unique and happy cloud-cuckoo land beyond the world of time and progress, but who is mentioned here primarily as a literary stylist as immaculate as one of his own white-spatted heroes.

Fine novelists of the period who were content to follow the "straightforward" tradition without undue experimenting include FRANCIS BRETT YOUNG (whose scene is usually Worcestershire), SHEILA KAYE-SMITH (Sussex), MARY WEBB (Shropshire and a Shropshire not unreminiscent of Hardy's Wessex), HILDA VAUGHAN (Wales), and PHYLLIS BENTLEY (West Riding), REBECCA WEST; VICTORIA SACKVILLE-WEST; C. E. MONTAGUE (a fine stylist); H. M. TOMLINSON; L. A. G. STRONG; HOWARD SPRING; A. J. CRONIN; CHARLES MORGAN; E. H. YOUNG; C. S. FORESTER. Also, although with the fading of romance the historical novel declined in favour, the satisfying work of MARJORIE BOWEN in this field should be noted.

All these were (and some still are), in their different ways, sound practitioners in the essential craft of the novelist, all adding something distinctive to the novel's history, their work reflecting minds unusually perceptive and individual.

J. B. Priestley (b. 1894), whether of set purpose or not, achieved rather more than this. The popular success of *The Good Companions* undoubtedly had a most wholesome effect on the history of the English novel at a moment when it was in very real danger of rapidly becoming submerged in a swamp of psychopathology. *The Good Companions* let in a great gust of healthy air, and the novel was able to breathe again. The book was as little concerned with psychology as its great exemplar, *The Pickwick Papers*. It went back defiantly to the simple traditional ingredients—a happy rambling, objective story about real


E. M. Forster


Aldous Huxley


Evelyn Waugh


James Joyce

people, ordinary people, recognizable people, amusing people. Priestley continued with his foursquare objectivity in *Angel Pavement* (1930), artistically a much finer achievement than *The Good Companions*, and several other long and entertaining novels, notably *They Walk in the City* (1936), though he soon made the writing of plays his chief means of expression and experiment. Of his later novels, *Bright Day* (1951) in particular conveys an unusually sensitive quality and sounds a deep note of human compassion.

But beyond all question the writer of the period who exercised the greatest influence on the novel was an Irishman, **James Joyce** (1882–1941). The impact upon other writers, as well as upon most readers, of his *Ulysses*, published in Paris in 1922 and banned in the United Kingdom until 1940, was both powerful and disturbing if not disintegrating. It is, indeed, possible that *Ulysses* may turn out to have been "the novel to end novels," for in that one work Joyce explored and exploited to the extreme limit (and some would say beyond) the possibility of the fictional form.

This enormously long book, far longer than any novel by Dickens or Thackeray, is an "Odyssey" with clearly traceable parallels to Homer's epic, recording in a sequence of impressions, the adventures in body, mind, and spirit of a few commonplace people in Dublin on one particular day in June 1904. There is an infinity of objective detail, brilliantly observed, and the historical documentation is as full and accurate and precise as to make it in some respects a wonderful period novel. It is still more remarkable for the extensive use of what was at the time of its writing a new technical device, the "interior monologue," conveying not only the conscious thoughts of a character, but also the unformulated subconscious thoughts and not unsuccessfully.

Many other original expedients are used, with varying success, notably the writing of a whole section in dramatic form, the *dramatis personae* including not only the people actually present in the scene but also all the concomitants, animate and inanimate, of their conscious and subconscious thoughts; and the extraordinary final section of 32 pages without a single note of punctuation, recording unforgettably the jumbled thoughts of a tired and exceedingly vulgar, but intensely human, woman as she lies awake in bed. As for style, the author changes it as often as he pleases; one section is written in a sequence of styles burlesquing those of the great writers of the past, another is written in the style of a cheap novelette. Here and there are passages of lyrical prose, elsewhere is American newspaper jargon, elsewhere again is a sequence of words deliberately misspelt, telescoped, linked up until at first glance they look like gibberish. Every traditional ingredient of the great novel is there: narrative, character-drawing, objectivity, subjectivity, symbolism, discursiveness, a recognizable background, infallibly accurate historical documentation.

Moreover, all the private thoughts, conscious and subconscious, upon which the record intrudes to such length, are utterly uncensored, unhampered in the recording by any regard to conventional decency. "Outspokenness" in print could progress no farther. Later essays in that direction have been childish by comparison. It was this fact, of course, which led, not surprisingly, to the banning of the book in the United Kingdom. Only a minority have read it—perhaps only a minority would wish to—but that minority has included almost every other novelist of note. They may have disliked it, but its influence was inescapable; and so was the feeling that in *Ulysses* the veritable ultimate in fiction had been achieved. Indeed, Joyce himself, in his next and final book, *Finnegan's Wake*, demonstrated that to attempt to push the art and craft of novel-writing any further would be only disastrous.

The following passage is typical of what confronts the would-be reader of this work:

Well, arundgirond in a waveney lyne aringarouma she pattered and swung and sidled, dribbling her boulder through narrowa mosses, the diliskydrear on

our drier side and the vilde vetchvine agin us, curara here, careero there, not knowing which medway or weser to strike it, edercider, making chattahoochee all to her ain chichiu, like Santa Claus at the cree of the pale and puny, nistling to hear for their tiny hearties, her arms encircling Isolabella, then running with reconciled Romas and Reims, on like a lech to be off like a dart, then bathing Dirty Hans' spatters with spittle, with a Christmas box apiece for aisch and iverone of her childer, the birthday gifts they dreamt they gabe her, the spoiled she fleetly laid at our door !

When art has so overreached itself as to be intelligible only to the artist and therefore ceases to be a means of communication, it disintegrates and is dead.

So the English novelists have drawn themselves back from the abyss which Joyce opened for them as if to reveal the logical end of the path they were pursuing so ardently ; and it cannot be said that they have yet discovered with any certainty a firmer and happier path.

The novel continues to change, of course, but some would say that it is dying fast as an art form. Economic conditions are far less favourable than they were in the 1930s to the publishing of novels. Good novels are still written, published, and read, and will probably continue to be, but there is no longer the bright halo about the art that the public once discerned so readily. Since 1945 the "best-sellers," the books that people feel they *must* read to keep abreast of current literary trends, the books most readily commended by the critics, have been biographies, histories, personal narratives and memoirs, works of criticism, philosophical and theological essays, just as frequently as, if not more frequently than, they have been novels. The popular thirst today is for fact rather than fiction. It may be that the hour or so that it takes to show a film is as long as many people are now prepared to spend on any effort of sympathetic imagination—apart, of course, from detective stories and "thrillers," which are in greater demand than ever.

The tendency of the "serious" post-war English novel has been towards an attempt to combine tough, terse realism (owing much to the example of the American novelist Ernest Hemingway) with romanticism, in the form of free poetic fantasy touched by the individual emotions of the writer (a quality that owes something to the Russian novelist Dostoievsky). Choice of plot and incident is often governed by the requirements of philosophical or religious speculation. The real world is not so much portrayed as subjected to critical questioning, often of a profound nature ; and if the process demands characters and incidents that are impossible or unreal, there is no hesitation about including them and making no pretence that they are anything but fantastic.

Various manifestations of these tendencies can be found in the novels of **Graham Greene** (b. 1904) ; the later satires of Evelyn Waugh (especially *Men at Arms* and *Officers and Gentlemen*) ; the grimmer political satires of **George Orwell** (Eric Blair : 1903–1950), *Animal Farm* and *Nineteen Eighty-four* ; and the stories of CHARLES MORGAN, HOWARD SPRING, L. P. HARTLEY, and many other competent novelists whose first reputations were founded in the 1930s. On the other hand, the story-telling tradition continues to be worthily represented by such writers as C. S. FORESTER and DAPHNE DU MAURIER ; while IVY COMPTON-BURNETT, in the exercise of an apparently artless art that conceals a wealth of shrewd judgement and much humour, is more of a 20th-century Jane Austen than one might have thought possible.

LESSON 48

American Literature: 19th Century

As Great Britain and the U.S.A. share a common language, so do they also share a common literature. As everyone knows, the English language as spoken in America has diverged slightly in the development of its vocabulary and idiom from that spoken in Great Britain ; and in the same way, and to just about the same extent, American literature has gradually established its own distinct and recognizable flavour. Inevitably the two literatures are closely inter-related ; and it is interesting to discover just wherein lie the similarities and the differences.

Speaking generally, it is fair to say that the creative, or imaginative, literature of the U.S.A. (i.e. poetry, fiction, drama, the essay) is rooted in the English tradition. Shakespeare, Milton, Keats, Shelley, Wordsworth ; Fielding, Jane Austen, Scott, Dickens, Thackeray, and others of their kind are the writers who have chiefly determined the pattern of American, as of English, creative literature.

These authors are equally widely read and revered on both sides of the Atlantic ; and so, too, are such Americans as Washington Irving, Fenimore Cooper, Hawthorne, Emerson, Longfellow, Poe, Bret Harte, Mark Twain, and O. Henry. With the passage of time and the gradual establishment of the independent American idiom, the later development of English fiction and drama has been itself influenced by the impact of American writers.

In this connexion one thinks immediately of Edgar Allan Poe as the real father of the modern detective story; of Herman Melville, the author of *Moby Dick*; of O. Henry's masterly short stories; of such novelists as Sinclair Lewis and Ernest Hemingway. It might also be remembered with gratitude that it was Louisa May Alcott, the American author of *Little Women* and *Good Wives*, who revolutionised the writing of stories for children in both countries.

On the other hand, it is equally fair to say that the less creative and more scholarly forms of writing in America have tended to follow German models rather than English. Books of history, travel, sociology, theology, philosophy, academic treatises of all kinds, works of criticism, even works of biography, are on the whole somewhat too ponderous, too prosaic, and too humourless for English taste. They can be laboriously professorial, altogether lacking in the imaginative glow which a Carlyle, a Charles Darwin, or a Ruskin would have imparted to them.

The first English book printed in America (1640) was a collection of metrical psalms. Other works of the colonial period, including the devotional works of two preachers, Cotton Mather (d. 1728) and Jonathan Edwards (d. 1758) and the issues of the first American magazine, *The General Magazine and Historical Chronicle for All the British Plantations in America*, which the great Benjamin Franklin founded in 1741, are little more than museum pieces. An exception is Franklin's remarkable autobiography.

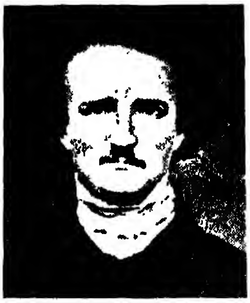
But once the War of Independence was over, the new transatlantic civilization was free to develop its own culture; and this it did with some rapidity. **Charles Brockden Brown** (1771 1810), who wrote tales of the forest life of the American continent, is claimed as the first American novelist. He is a figure of little importance apart from that; and his popularity was soon exceeded by that of **James Fenimore Cooper** (1879 1851). Cooper established a broad New World setting of forest, plain, and sea for such thrilling stories as *The Spy*, and introduced a new kind of romance in *The Last of the Mohicans*, *The Pathfinder*, *The Deerslayer*, and other tales of the Red Indians. Incidentally, these were not primarily intended by their author to be, what they have become in England, adventure stories for boy readers.

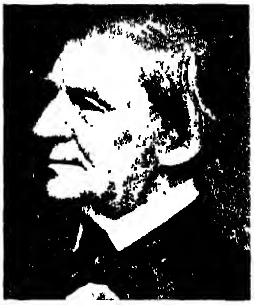
The earliest outstanding name among American writers is that of **Washington Irving** (1783-1859), essayist and historian, remembered for his humorous *Knickerbocker's History of New York* (which gave a new word to the language, still in everyday use in its contracted form, "knickers") and still more gratefully for his *Sketch Book* and *Bracebridge Hall*. The *Sketch Book* contains the story of "Rip Van Winkle" and "The Legend of Sleepy Hollow." Irving's heart beat very closely in tune with that of England. He also loved Spain, where he lived for many years, both before and after his appointment as American Minister at Madrid, 1842-46. While there, he amassed material for his *History of the Life and Voyages of Columbus*, *The Conquest of Granada*, *Voyages of the Companions of Columbus*, *The Alhambra*, and *Legends of the Conquest of Spain*. He also published biographies of Oliver Goldsmith and (his most ambitious work, in five volumes) of George Washington. That peculiar American distinction in the method of approach to imaginative writing and factual writing is already traceable in Irving's work; but it is to be noted that the cast of his imagination had little that could distinguish it from that of an Englishman, and that he was particularly happy in directing it upon English themes.

The first important American poet was **William Cullen Bryant** (1794-1878). After some years as a lawyer, he turned to journalism, becoming editor-in-chief of *The New York Evening Post* and conducting that paper according to his own high principles. His poem in blank verse, *Thanatopsis*, appeared in 1817, and was at once acclaimed in his own country as the finest poem so far produced there. He also wrote a number of short lyrics which revealed literary kinship with Gray and Cowper, yet were also marked by the expression of his individual response to the breadth and sway of nature in the New World.

Another poet, of restricted output but of world stature, was **Edgar Allan Poe** (1809 49), one of the tragic figures of literature. Left destitute as an orphan at the age of three, he was adopted and unduly indulged by a well-to-do tobacco merchant of Virginia, but the kindness was ill requited. Poe received his early education in London, returning to America in 1829. After his expulsion from West Point military academy for insubordination, gambling, and general dissipation, he was disowned by his adoptive father, who died in 1834 without making any provision for him. Poe had already won a competition for a prize poem tale, and began to rely on literature for a livelihood. He gained positions on several leading magazines, but retained none for long because of his intemperate habits. He fell deeply in love with a child whom he married before her fourteenth birthday, and came nearer to happiness with her than ever before. She died some ten years later, and he gave her immortality in a beautiful and poignant poem, "Annabel Lee," but her


Washington Irving


Edgar Allan Poe


R. W. Emerson


Nathaniel Hawthorne

departure completely and finally broke his spirit. He became an opium addict as well as a confirmed drunkard, and died in sordid circumstances at the age of forty. But his genius has never been questioned

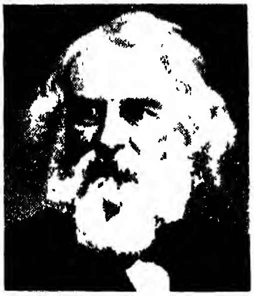
As a poet he is remembered for such haunting pieces as "The Raven," "The Bells," and "To Helen," in addition to "Annabel Lee." His short stories remain as indestructible monuments to the brilliance of a fantastic, if often morbid, imagination. They are published as *Tales of Mystery and Imagination*, though many of them (e.g. "The Fall of the House of Usher") are also tales lit with sinister terror. All reveal extraordinary power of construction. In "The Gold-Bug," "The Murders in the Rue Morgue," "The Mystery of Marie Roget" and "The Purloined Letter," he was the pioneer of the modern detective story, his character Auguste Dupin being, in his use of inductive reasoning, the forerunner of Sherlock Holmes. Poe's own powers of inductive reasoning were formidable. "The Gold-Bug" is concerned with a cryptogram, and Poe maintained that any cryptogram devised by human ingenuity could be resolved by the same means. He even made a bold attempt to solve by such methods the whole mystery of human existence His influence as a writer of short stories, to which R. L. Stevenson paid tribute, was even greater in France than in England or America. In America the most successful later exponent of the *macabre* was **Ambrose Bierce** (1838-?1914), whose many short stories have often been compared to those of Poe.

A kind of golden age of American literature began about 1840 with the emergence of a remarkable group of contemporary writers in the state of Massachusetts, several of them—Hawthorne, Emerson, Thoreau, and Louisa May Alcott—living in the one small town of Concord.

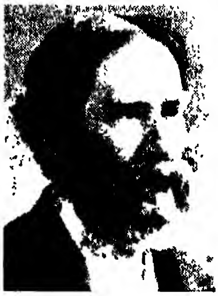
Ralph Waldo Emerson (1803–82), essayist and critic, was the loftiest figure of the group. A native of Boston, Mass., he was a man of singularly fine character, and the general esteem in which he was personally held added much to the influence of his writings. It has been said that he did more than any other American writer of his time to make people think. He was brought up among a family of six by a widowed mother, a family where the reading of Shakespeare, Milton, Addison, and Pope, and of translations of Plato and Plutarch, were regarded as normal intellectual occupations. He became a Unitarian minister in Boston, but resigned when he found his religious views exceeding the orthodoxy of his congregation. After a tour of Europe, which brought him the warm, lifelong friendship of Thomas Carlyle, expressed in a correspondence which lasted nearly thirty years, he settled at Concord, and devoted his time to lecturing and writing, visiting England once more to stay with Carlyle. His reputation rests mainly upon his Essays and Discourses, based upon the large variety of subjects dealt with in his lectures. The volumes entitled *Representative Men* and *English Traits* are of particular interest, but all his work is informed with deep wisdom. He was always concerned with his own religious problems, and evolved his own form of belief, which inclined towards a Pantheism that found its earliest expression in his book *Nature*.

Henry David Thoreau (1817–62), born at Concord, was closely associated with Emerson both in his life and in his ideas. From 1845 to 1847 he lived a solitary and contemplative life in a hut on the shores of Walden Pond, near Concord. Providing for his wants by casual labour, he discovered that he could easily earn enough in six weeks to satisfy his needs for a whole year. He became intimate with the animal and bird life around him, then wrote of his experiences in a book entitled *Walden, or Life in the Woods*, one of the most delightful nature books ever written, published in 1854. He also wrote *Excursions* and *The Maine Woods*, both appearing after his death from tuberculosis. Predominant in his work is a somewhat dogmatic idealism, not far removed from Emerson's philosophy.

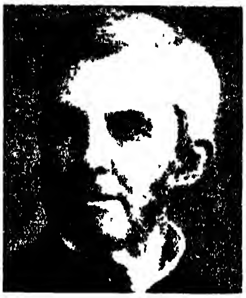
H. D. Thoreau



H. W. Longfellow



J. R. Lowell



O. W. Holmes

Nathaniel Hawthorne (1804–64) was born at Salem, Mass. He, too, followed his college career by a period of seclusion, lasting in his case for twelve years, spent in reading and meditation. Then he resolved to live by his pen, and found his true métier in fiction. His first book of short stories, *Twice Told Tales*, appeared in 1837, revealing a preoccupation with sin, conscience, and evil. When he married, in 1842, he moved from Salem to Concord, where he lived in the Manse where the Emerson family had once lived. Here he eventually wrote his two masterpieces, the novels *The Scarlet Letter* (1850) and *The House of the Seven Gables* (1851). The first-named, besides presenting a picture of Puritan New England, is a study of the ravages made by the sin of adultery in the hearts and consciences of husband, wife, and lover. It is a fine work of imagination, wrought with felicity of phrasing and an exquisite sense of rhythm.

Henry Wadsworth Longfellow (1807–82) became the most popular of America's poets, also the one most widely known in other countries. He was not a native of Massachusetts but of another New England state, Maine ; but he came almost inevitably to Massachusetts as Professor of Modern Languages at Harvard, 1836–54, and died at Cambridge, Mass.

Longfellow is most widely known by his shorter verses, such as "The Village Blacksmith," "Excelsior," "The Psalm of Life," "The Wreck of the Hesperus," and "The Children"—didactic, and in sentiment and expression somewhat commonplace, easy prey for the irreverent parodists—and by the excellent narrative verse in his *Tales of a Wayside Inn*.

But he also wrote much that was imbued with deep feeling and warm sympathy ; he was a master of metre ; and in his three longest poems, "Evangeline" (1847), "Hiawatha" (1855), and "The Courtship of Miles Standish" (1858), he achieved a level on which the most solid reputation might well rest. Moreover, these three poems were all emphatically American in theme and vision, "Hiawatha" being an epic of the Red Indian, and the other two being concerned with the New England settlers.

Later he produced a trilogy of love verse-dramas under the general title of *Christus ; a Mystery*, consisting of "The Divine Tragedy," "The Golden Legend," and "The New England Tragedies," depicting phases of religious intolerance and Divine compulsion, first in the lifetime of Christ, secondly in medieval Europe, and finally among the Puritans in America.

If Longfellow lacked the qualities necessary to the achievement of a really great poet, he knew how to appeal directly to the hearts of a multitude of simple readers, and his chivalrous character is patent in all his work.

James Russell Lowell (1819–1891), poet and essayist, born at Cambridge, Mass., the son of a Unitarian minister, was Professor of Belles-Lettres at Harvard for twenty-two years, and U.S. minister in London for five years. He was also at various times editor of *The Atlantic Monthly* and *The North American Review*. Lowell was a man of many gifts, a scholar with a pleasant touch of satirical humour, and a discerning critic. His verses in Yankee dialect represent a notable and original contribution to specifically American literature. The original series was inspired by his opposition to the Mexican war, and began to appear in *The Boston Courier* in 1846, over the pseudonym of Hosea Biglow. They were published as *The Biglow Papers* in 1848 , and a second series, prompted by the Civil War, began in *The Atlantic Monthly* in 1862, and was also published in volume form a few years later. Lowell was also a strong advocate for the anti-slavery campaign, a political movement that occupied the minds and pens of many American writers at this time. The best of his literary criticism is to be found in his two volumes, *Among My Books* (1870–76).

Lowell may be credited with having discovered the literary gifts of **Oliver Wendell Holmes** (1809–94), another native of Cambridge, Mass. a medical doctor and professor of

anatomy at Harvard. It was for Lowell's *Atlantic Monthly*, to which Holmes was invited to become a regular contributor, that Holmes wrote the three books by which he is best remembered: *The Autocrat of the Breakfast Table* (1853), *The Professor at the Breakfast Table* (1860), and *The Poet at the Breakfast Table* (1892), discursive essays, and character sketches, humorous, urbane, intensely personal and charming in their frank self-revelation. His novel, *Elsie Venner*, has been described as "with the exception of the story of Eve, *par excellence* the snake story of literature"; but this and his minor works of fiction were less happily suited to his nature than the essays and the pleasing verses that he introduced from time to time into his prose works. Among the verses that gained wide popularity are "The Chambered Nautilus," "The Last Leaf," "Homesick in Heaven," and "The One-Hoss Shay."

Another poet who was an ardent and enlightened supporter of the anti-slavery party, and wrote many moving verses and prose pamphlets full of flaming rhetoric against the evil, was **John Greenleaf Whittier** (1807-92), a native of Haverhill, Mass., and an eventual contributor to Lowell's *Atlantic Monthly*. He was a Quaker, who inherited all the Quaker calm of spirit and could yet write stirring poems about the American Civil War. In his early verses he was something of a New England Burns, a poet of nature. His "Snow-bound" affords a vivid picture of the rural life he knew best. There is genuine charm in such ballads as "Maud Muller" and "Barbara Frietchie"; and untold numbers have found comfort in certain characteristic verses that have found their way into the hymn-books, including "Dear Lord and Father of mankind" and "Immortal Love, for ever full."

Mention of the anti-slavery movement makes this the most convenient place to mention *Uncle Tom's Cabin*, by **Harriet Beecher Stowe** (1811-1896). It is not by any reckoning a great work of literature, but its phenomenal success and its far-reaching political influence make up a remarkable piece of literary history. Mrs. Stowe was a parson's wife, the daughter of one famous American preacher and the sister of another. Before 1851 she had published only one volume of short stories, which had attracted little attention. *Uncle Tom's Cabin*, written with difficulty in time snatched from household chores and the claims of a large family, first appeared as a serial story in *The National Era*. It is a picture of slavery, possibly biased and sentimental, but written with fierce, compelling passion, and creating in Simon Legree, the brutal slave-driver, such an embodiment of human evil as fits him to rank with the most memorable of villains. It is to be remembered to her credit that Mrs. Stowe had had no personal experience of slave-owning society. Her picture was the work of an imagination inspired with anger; but it was nevertheless convincingly enough documented to make a profound impression on those who read it. If ever there was a "novel with a purpose," this was it. Its purpose was to arouse nation-wide anger, and the purpose was achieved, for the book undoubtedly hastened the day of emancipation. It is an ironic commentary on dead politics that in Great Britain at least this bitter, horrifying book has come to be thought of, like *Gulliver's Travels*, as a book for children. Mrs. Stowe's later stories merit no mention here.

While Mrs. Stowe was still writing her famous story, there was published a novel by another American which has come to be assessed as one of the greatest works of fiction ever penned. This was *Moby Dick, or the White Whale*, by **Herman Melville** (1819-91). Melville had sailed at sea before the mast at the age of 17, and three years later had served in a Pacific whaling ship. He also had undergone hair-raising adventures as a captive among cannibals of the Marquesas Islands. *Moby Dick*, a powerful and at times terrifying story of whales and whaling, was generally regarded on its first appearance as just another "tall yarn"; but some twenty years after the author's death it began to be recognized that here was a work of genius, revealing an unexpected mastery of psychological "atmosphere." The most interesting of Melville's other books are *Typee* (1846), a narrative of life in the islands of the Pacific, some short stories collected as the *Piazza Tales*, and the short fragmentary draft, *Billy Budd*, found among his papers after his death and not published until the 1920s, ostensibly a story of British seamen but really a penetrating and tragic study in "motiveless evil," reminiscent of Shakespeare's Iago, in *Othello*.

With **Walt Whitman** (1819-92) we reach something altogether new and original, a poet who was the first to rebel against all the accepted conventions of rhythm and rhyme, and was equally an iconoclast in his themes. His *Leaves of Grass* (1855) marks the beginning of the movement for *vers libre*. He had also employed such devastatingly frank methods of handling sexual relationships in his writings as to make him the centre of long and bitter controversy. After serving as a nurse in the Civil War—his experiences being incorporated in two further volumes of characteristic verse, *Drum Taps* and *The Wound Dressers*—he was appointed to a government clerkship, only to lose it on the charge of having written immoral books; and this led to further violent

Herman Melville

Walt Whitman

Mark Twain

Bret Harte

controversy. Revolt of all kinds seemed to Whitman to be his self-appointed mission ; yet his work at its best, as in the noble lines of " My Captain," show genuine poetic insight and power.

Emily Dickinson (1830–86) was a recluse who wrote poems, mostly brief lyrics, worthy to rank with the world's greatest. Exquisitely composed, they have a poignant introspective quality, revealing a mystical experience few can expect to share fully. The poems were unknown in her own lifetime, but when a selection of her work was published in 1892 her greatness was readily acknowledged, though only much later was it generally appreciated. Her complete works were not published until 1925. The highly concentrated style has been likened to that of Emily Brontë

The leading American historians and biographers of the period can be dismissed very briefly, for their work was, generally speaking, more distinguished for painstaking scholarship than for literary grace, as indicated at the beginning of this Lesson. **George Bancroft** (1800–91) spent some forty years in writing a History of the United States from the discovery of the continent to the end of the War of Independence in 1782. If he had continued the history to his own day on the same scale, it would have filled between seventy and eighty volumes He also wrote a formidable *History of the Formation of the Constitution of the United States*. It may be gathered that he had formed a high ideal of his responsibilities as an historian. **William Hickling Prescott** (1796–1859), who had the misfortune to go blind as a young man, published in 1837 a *History of Ferdinand and Isabella*, after ten years of study This was followed by his *History of the Conquest of Mexico* and *History of the Conquest of Peru*, and an uncompleted *History of Philip II*. **George Ticknor** (1791–1871) compiled a *History of Spanish Literature* and biographies of Lafayette and W. H. Prescott. **John Lothrop Motley** (1814–1877) established a reputation with the celebrated book on *The Rise of the Dutch Republic* (1856), which has the merit of a more vivid and readable style than is usual among American historians, but suffers from a lack of judicial impartiality which makes it unreliable. He also wrote on *The United Netherlands* (four volumes), and *The Life and Death of John of Barneveld*, unfavourably received by Dutch scholars. **Francis Parkman** (1823–93) specialised in the history of the conflict between England and France in the struggle for Canada, and produced many excellently documented and clearly written volumes on the subject.

Four important writers remain to be mentioned before we reach the turn of the century, all four more innately " American " than any previously mentioned.

The earliest notable divergence from the English tradition was expressed through the newer notions of humorous writing. America, indeed, has quickly evolved her own form of humour, and it remained clearly recognizable as her own until, indeed, the English began to adopt it for themselves. It is based on a mixture of grotesque exaggeration, especially in metaphor, " smartness " and a pert, *enfant terrible* irreverence for the pomposities of literary tradition.

This native brand of humour found its first real exponent in **Artemus Ward** (Charles Farrar Bourne : 1834–67), whose original contribution to literature took the form of ungrammatical and misspelt letters describing the imaginary adventures and misadventures of a travelling Yankee showman. *Artemus Ward : His Book* (1862) was followed by *Artemus Ward : His Travels* (1865) and *Artemus Ward in London* (1867).

Artemus Ward was a forerunner of the great **Mark Twain** (Samuel Langhorne Clemens : 1835–1910), who exploited the new American humour even more successfully. His first book, *The Innocents Abroad* (1869), a cheerfully irreverent account of his travels in Europe, established his reputation. Other books in the same line were *A Connecticut Yankee at the*

Court of King Arthur (1889) and *Personal Recollections of Joan of Arc* (1896). His humour was exuberant, but beneath it was a satirical force and a Dickensian passion for social justice and hatred of shams. Moreover, he wrote two wonderful stories of American boyhood, *The Adventures of Tom Sawyer* (1876) and its companion *Huckleberry Finn* (1885), stories that seem likely to live long after all else he wrote has been consigned to the literary lumber-room. So highly was Mark Twain esteemed in England as a representative American, with his shock of white hair and his fondness for corn-cob pipes, that the University of Oxford conferred upon him in 1907 the honorary degree of LL.D.

These two writers first established American humour as something that the New World could offer the old. It was to be developed later by Finlay Peter Dunne (1867-1936), through the mouth of his Irish-American creation "Mr. Dooley." The kindly genius of O. Henry fanned it to a glowing blaze, and the same brilliant quaintness was to be found, decades later, in the subtle character sketches of Damon Runyon, and in the humours of James Thurber and Robert Benchley, and in the pages of *The New Yorker*. It was to become all too apparent in the elaborate "wisecracks" of American comedy scripts for films and radio. It has been said that American slang is the true poetry of a great nation, and at least the "wisecrack," no less than the epigram, may claim consideration as a form of literary art.

Meanwhile a third great and unmistakable American had appeared in **Joel Chandler Harris** (1848-1908), the creator of the ever-delightful Brer Rabbit. His little fables of animal life in the southern plantations are told by "Uncle Remus" in Negro dialect. They have been highly popular with both children and adults, and have also attracted students of Negro folk lore and anthropology.

Our fourth outstanding American figure, **Francis Bret Harte** (1839-1902), was in turn teacher, miner, and journalist. It was as the chronicler of the Californian gold-field that he first attracted notice. His original sense of humour is displayed in his *Condensed Novels*, a collection of parodies. But he was, above all, a master of the short story; and in that medium and within his limited range he could manipulate a dramatic situation brilliantly, with terse, tough realism, strong in local colour, yet with genuine human tenderness. *The Luck of Roaring Camp*, *The Outcasts of Poker Flat*, *Miggles*, and *The Idyll of Red Gulch* are among the most effective short stories ever written. Bret Harte also wrote deft, delicate, and often amusing verse.

LESSON 49

American Literature: 20th Century

THE onset of the 20th century did not mark any immediate emergence of a more distinctive note in American literature. For some years, whatever was the popular fashion in writing and reading in England prevailed also on the other side of the Atlantic, and the leading American and British novelists of the period were, so to speak, interchangeable. On the American side these included FRANCIS MARION CRAWFORD (1854-1909), ROBERT WILLIAM CHAMBERS (1865-1933), GERTRUDE ATHERTON (1857–1948), and BOOTH TARKINGTON (1869-1946). If any difference was to be noted, possibly it was the greater success of the American writers of sentimental stories, such as FRANCIS HODGSON BURNETT (1849-1924: *Little Lord Fauntleroy*), KATE DOUGLAS WIGGIN (1856-1923: *Rebecca of Sunnybrook Farm*), ALICE HEGAN RICE (1870-1942: *Mrs. Wiggs of the Cabbage Patch*), and GENE STRATTON PORTER (1868-1927: *Freckles* and *A Girl of the Limber-Lost*).

Yet this is the place to mention more fully the achievement of **William Sydney Porter** (1862–1910), who produced under the pseudonym of "O. Henry" a stream of remarkable short stories which did much to establish the American idiom in literature in its own right. It was not only that he chose to direct his warm humour and deep human compassion consistently and specifically upon the ordinary people of America, especially on the man in the New York street or woman in the New York lodging-house, on policemen, shop-girls, shabby clerks, typists, waiters, down-at-heel journalists and ne'er-do-wells of all kinds; though this he certainly did. His originality was equally evinced in his technique, which was marked by an unsurpassed terseness of statement (though this owed something to Kipling), and, above everything, by his love of the surprise ending. Often the whole significance of a short story by O. Henry lies in its concluding phrase. This may be called a trick, though "device" is perhaps a more just word; but it is a trick or device which was exploited by O. Henry as no one had exploited it before, and in his masterly hands it helped to give his work its exceptional vitality.

Two other distinguished American novelists, whose reputations were established in the earlier

O. Henry

Jack London

Edith Wharton

Sinclair Lewis

years of the century, were **Owen Wister** (1860–1938), chiefly remembered for his story of the Wyoming cattle country, *The Virginian*, and **Edith Wharton** (1862–1937), who modelled her style on that of Henry James. Her main themes were concerned with the light moral standards of high society, the sordidness of New York's middle-class life in the 19th century, and the supernatural. In an essay *The Writing of Fiction*, she revealed her own literary ideals thus.

> Every great novel must first of all be based on a profound sense of moral values, and then constructed with a classical unity and economy of means.

Among many notable approximations to her own high standards may be mentioned such novels as *Ethan Frome*, *The Age of Innocence*, *The Children*, *Hudson River Bracketed*, and *The Gods Arrive*.

Nevertheless it was not until the years following the First World War that American creative literature could be generally recognized as having at last emerged as a separate and vital force. The process began with the growth of a new school of realistic fiction led by **Sinclair Lewis** (1885–1951) and **Theodore Dreiser** (1871–1945). Lewis was the first American to be awarded the Nobel prize for literature. It is true that he originally owed much of his narrative style and his manner of surveying the social scene to such English masters of objective writing as Wells and Bennett ; but his subject-matter was essentially and effectively all-American. It was he who first consciously set out, in *Main Street*, *Babbitt*, and other novels, to present America, not only to itself but also to the rest of the world, as a phenomenon unlike any other. This was not done complacently, for Lewis was a satirist and his picture of America and American types was often pitiless. *Babbitt*, for example, reveals the average American business man as intellectually stagnant, and indeed a somewhat pitiful creature, however lovable in his deficiencies ; *Elmer Gantry* is a bitter novel about American proneness to sham, showy religion ; and *It Can't Happen Here* was a direct exposure of the perils of political self-complacency in " God's own country."

Dreiser's *American Tragedy*, published in 1925, set the seal on the rebellious realism of his earlier novels. The author triumphed over the disability of a clumsy style by sheer power and honesty of purpose, his ardent desire to portray the truth.

But the greatest single influence in the development of the American school of creative literature at this period was undoubtedly the critic **Henry Louis Mencken** (1880–1956). Himself the author of a scholarly work on *The American Language*, he founded in 1924 with George Jean Nathan, an equally forceful critic of the drama, a literary periodical, *The American Mercury*, which he edited from 1925 to 1933. Using this as his pulpit, he set new standards of fearless literary and social criticism, and, more important, he became spokesman for, and leader of, a revolt against all that was academic and " moronic " in literature. He succeeded in creating a wider audience for such realistic novelists as Sinclair Lewis and Theodore Dreiser, Willa Cather, James Branch Cabell, Sherwood Anderson, and Ernest Hemingway, and for such poets as Robert Frost and Carl Sandburg.

Mencken's influence waned only after its work was accomplished and a younger school of realists, harsh and iconoclastic but strong and courageous, and owing little or nothing to any tradition outside America, had emerged to find a ready audience.

The special field of **Willa Cather** (1876–1947) was the pioneering life of immigrants to the Middle West, as depicted in her *O Pioneers !* and *My Antonia*. Her two best-known books, *Death Comes to the Archbishop* and *Shadows on the Rock*, consist of a series of separate and skilfully observed incidents linked by the interlocking of the actions of her characters—and very delightful characters they are.

James Branch Cabell (born 1879) put into successful practice his theory that fiction should

be allegorical, deliberately interpreting the drama of life as it should be, not as it is. His notion was that it is false for a writer to be true to life, because " facts out of relation to the rest of life become lies." So he searched for a more subtle form of realism. His fiction falls into two categories: comedies of contemporary life in Virginia, and caustically satirical romances of the Middle Ages, set in an imaginary French province, and wearing a mocking air of pseudo-erudition. Examples of the former are *The Cords of Vanity*, *The Rivet in Grandfather's Neck*, and *The Cream of the Jest*; of the latter, *Jurgen* (ranked by many as his finest and most characteristic achievement), *Figures of Earth*, and *The Silver Stallion*.

Sherwood Anderson (1876 1941), both in his short stories and in his longer fiction, strikes a note of indifference to tradition. His emphasis is on the importance of individual lives, however insignificant; and he is concerned with the aspirations of industrial America. His novel *Poor White* relates how machinery came to mar the dignity and significance of a town, while his *Dark Laughter* contrasts the happiness of free Negroes with the spiritual deficiency of white people.

Ernest Hemingway (b. 1898), another Nobel prizewinner, developed a prose style that has been widely imitated on both sides of the Atlantic. It was based on the depiction of violent incidents and dramatic emotional crises by means of a studied simplicity of diction, from which any consciousness of violence or drama was eliminated. His sentences are short and stark, almost wantonly so. Outstanding examples of his work are *A Farewell to Arms*, *Winner Take Nothing*, and *For Whom the Bell Tolls*.

The work of the poets whom Mencken sponsored will be considered presently.

The forceful, almost brutal realism which has characterised so many later American novels goes back in its origins at least as far as Bret Harte. His " tough stuff " themes were echoed, sometimes to excess in the matter of quantity, by **Jack London** (1876–1916), a virile, prolific, and popular writer of short stories and long novels about hard work, endurance, and adventure in various forsaken parts of the world. At his best, as in *The Call of the Wild*, *Adventure*, *White Fang*, and *Martin Eden*, he was shown to be a writer of considerable power.

In the hands of a lesser but even more popular writer, **Zane Grey** (1875–1939), this particular *genre* petered out into little more than a blatant romanticising of the adventurous life. But another vein, opened up early in the century, has led to a far richer field. This was the novel of American industrial life and its problems. Jack London glanced at it momentarily in *The Iron Heel*. **Frank Norris** (1870–1902) planned a trilogy on the epic of wheat, but lived only long enough to complete the first two books, *The Octopus* (the raising of wheat in California) and *The Pit* (speculation on the Chicago wheat exchange). Here was the promise of bitter realism. To bitterness was added anger when **Upton Sinclair** (b. 1878) published in 1906 his sensational revelation of conditions in the Chicago meat-packing industry in his novel *The Jungle*. Sinclair wrote upwards of 100 books, consistently attacking undesirable industrial social conditions. They include *King Midas*, *The Metropolis*, *King Coal*, *Oil*, and *The Brass Check*. In later life he produced a long sequence of sociological studies in fiction form, all having the same central character.

To younger realists of the post-Mencken school, the economic and industrial depression of the 1930s presented the perfect target for their realism, a target they could attack with all the forceful terseness of Hemingway and all the bitterness and anger of Frank Norris and Upton Sinclair. Characteristic of such writers was **John Dos Passos** (b.1896), especially in a trilogy—*The 42nd Parallel*, *Nineteen-Nineteen*, *The Big Money*, and in *Manhattan Transfer*. Others were **John Steinbeck** (b. 1902: *The Grapes of Wrath*, *Of Mice and Men*, *The*

Willa Cather

J. B. Cabell

Ernest Hemingway

Theodore Dreiser

E. Arlington Robinson

Robert Lee

Carl Sandburg

Vachel Lindsay

Moon is Down), who concerned himself especially with the problem of the farm labourer ; ERSKINE CALDWELL (*Tobacco Road*), WILLIAM SAROYAN, WILLIAM FAULKNER, and WILLIAM M'SHEE.

Meanwhile **John P. Marquand** (b. 1893), a writer following much more restrained tradition, was equally a realist, even though preferring to concentrate on the ironic undertones of realism in such delightful studies of Boston life and character as *The Late George Apley* and *H. M. Pulham, Esq.* It may well be that later generations of American readers will be more ready to accept such work as great American literature than the harsh, strident insistence of the other realists.

Shortly before the Second World War there were signs of a reaction against realism, evinced in the popularity of the novels and plays of **Thornton Wilder** (b. 1897 : *The Bridge of San Luis Rey*), all revealing a thoughtful preoccupation with experimental form and style ; of **Pearl Buck** (b. 1892), another Nobel prizewinner, who wrote *The Good Earth* and other novels of life in China ; and of audaciously long historical evocations such as HERVEY ALLEN'S *Anthony Adverse* and MARGARET MITCHELL'S *Gone with the Wind*.

American poetry began its 20th-century development earlier than the American novel. About 1910 there was a strong reaction against tradition, and new experiments in verse form, following the example of JAMES WHITCOMB RILEY (1849-1916), RICHARD HOVEY (1864-1900), and WILLIAM VAUGHN MOODY (1869-1910), gave rise to much critical controversy. A revival of interest in Walt Whitman (*see* Lesson 48), and the foundation in 1912 of a magazine called *Poetry*, gave impetus to the new movement.

It found its leading spirits in **Edwin Arlington Robinson** (1869–1935) and **Robert Lee Frost** (b. 1875). Robinson, concerned by the sense of tragedy in the world and pursuing with faith the glimmer of light that lies beyond, excelled in character studies (*The Children of the Night*, *Captain Craig*, *The Man who Died Twice*). He also wrote his own version of the Arthurian legend, from which the supernatural element is removed, leaving the characters to act according to their own various passions. In his longer narrative poems he used unrhymed verse.

Much of the poetry of Frost, restrained both in emotion and diction, and tinged with a quality akin to mysticism, is inspired by the beauty of the New England countryside and the simplicity of New England character. He makes full use of colloquial New England speech.

From the Middle-West came **Edgar Lee Masters** (1869–1950), **Carl Sandburg** (b. 1878), and **Nicholas Vachel Lindsay** (1879–1931). Masters gained fame by his *Spoon River Anthology*, in which, in free verse, he made the dead in a village churchyard pronounce the truth about themselves in contrast to the epitaphs on their tombstones. The verse is, indeed, so free as to be undistinguishable from prose, though it possesses cadence. Later works include *The Doomsday Book*, and its sequel *The Fate of the Jury*.

Sandburg, in presenting the more brutal aspects of life, especially among the stevedore and lorry-drivers of the Middle-West, also wrote free verse, vigorous and colloquial. Yet he is at his best in gentler mood, enchanted by the beauty of the prairieland and the nobility of character of which ordinary people are capable. *Chicago Poems*, *Cornhuskers*, *Smoke and Steel*, *Slabs of the Sunburnt West*, and *Good Morning, America*, contain most of his finest work. He also wrote a monumental biographical study of Lincoln.

Of Vachel Lindsay it must be said that his earlier poetry is of the more enduring importance. He wrote much doggerel, which became at times a sort of poetic jazz, using rhyme and rhythm with brilliant originality—in *The Congo*, for example, where the rhythm is that of the tom-tom's insistent beat. He first captured public attention and approval with

Eugene O'Neill

Thornton Wilder

Robert Sherwood

Paul Green

two poems with titles as original as their form, *General Booth Enters Heaven* and *Abraham Lincoln Walks at Midnight*.

A group calling themselves the Imagists strove to follow their own expressed principles that poetry should produce an image, avoiding all vagueness, should use new rhythms to express new moods, and should remould the language of everyday speech to new degrees of exactness and concentration of meaning. Their leading exponents were the erudite EZRA POUND (b. 1885), AMY LOWELL (1874-1925), JOHN GOULD FLETCHER, CONRAD AIKEN, and HILDA DOOLITTLE. The reader of Imagist poetry usually finds difficulty in convincing himself that he is reading poetry, not some new kind of polyphonic prose.

Poets of the later (post-Mencken) realism include EDNA ST. VINCENT MILLAY (1892 1950) and JESSE STUART (b. 1907).

As for dramatic literature, a specifically American contribution has developed in the 20th century. The list of dramatists is necessarily headed by **Eugene O'Neill** (1888 1953), a third American Nobel prizewinner. *The Emperor Jones*, *Anna Christie*, *The Hairy Ape*, *All God's Chillun Got Wings*, *Desire Under the Elms*, *The Great God Brown*, *Strange Interlude*, *Mourning Becomes Electra*, and *Ah, Wilderness* have become established as classics of the American stage. They are marked by dynamic vigour and emotional intensity, governed by a forceful and original intellect.

Maxwell Anderson (b. 1888) contributed among other finely conceived and constructed plays, *Winterset* **Elmer Rice** (b. 1892) will be remembered for his expressionistically conceived *Adding Machine*, his unusually realistic *Street Scene*, and his uproarious extravaganza, *See Naples and Die* **Thornton Wilder** exploited brilliant new dramatic technique in order to reveal the profundity and beauty of his thought, notably in *Our Town* and *The Skin of Our Teeth*.

There are, too, the questioning insistence of **Robert E. Sherwood** (1896 1955) in such plays as *The Petrified Forest*, *Idiot's Delight*, and *There Shall Be No Night* ; and the hauntingly beautiful tragedies of **Paul Green** (b. 1894) including *The House of Connelly* and *Potter's Field*.

There is no space to mention more. Enough has been said to make the student aware of the permanent importance of contemporary dramatic writing in America.

LESSON 50

Commonwealth Literature

OUR survey of English Literature would be incomplete without some notes on the contribution from the various English-speaking countries of the Commonwealth of Nations. The story of that contribution is necessarily short because the countries are still young, even younger than the United States. Like the United States, too, the distant countries that were destined to develop into the great Commonwealth were during many of their earliest years of settlement too fully occupied with their pioneering problems to allow any literature to take root. In the first instance they looked, as America had looked, to the mother country as the source of their literature, sharing with her the common inheritance of Chaucer, Shakespeare, Milton, and other giants of the past. They were glad to import all their books for a time.

It must also be remembered that many writers who became, by the choice and treatment of their material, representative writers of the lands of their adoption were nevertheless born in Great Britain (or, sometimes, Ireland). On the other hand, especially as time went on, other writers born and bred in the new countries

settled eventually in Great Britain and produced most of their best work there. Notable examples are Sir Gilbert Parker and Katherine Mansfield, who might well find a mention in any survey of English literature that confined itself to the literature of Great Britain alone. For these reasons it is not always easy to drive a hard and fast line of distinction.

The following lists, however, though they make no claim to be complete, do serve to "place" various writers of individual distinction whose impact upon the full story of English literature and its development should not go unrecorded. They do not include the name of any outstanding genius worthy of comparison with the greatest figures with whom this course has been concerned. But they have helped, or are helping, to shape the structure of new branches from the main stem, branches from which in course of time there may yet flower a Canadian Shakespeare, an Australian Milton, a New Zealand Dickens.

CANADA

Thomas Chandler Haliburton (1796–1865), remembered chiefly as the creator of "Sam Slick," a humorous Yankee character, originally introduced in a series of anonymous newspaper sketches, these being eventually collected in book form (1837–40) as *The Clockmaker, or Savings and Doings of Samuel Slick of Slickville.* Haliburton was a native of Nova Scotia, and wrote an authoritative historical work on that province.

Joseph Howe (1804–73), another Nova Scotian, a poet and essayist.

Valancy Crawford (1850–87), an Irish-born poetess, the first to write poetry directly inspired by the Canadian scene. She wrote many dialect verses.

William Henry Drummond (1854–1907), poet, also Irish-born, though all his verse bears the authentic Canadian touch. He found inspiration in the lives of the French-Canadian settlers, making their quaint French-English a charming medium for such collections of poetry as *The Habitant, The Voyageur*, and *Johnny Courteau.*

Archibald Lampman (1861–1899), Canadian-born poet, who wrote pleasant, musical verse in *Among the Bullets* and *Lyrics of Earth.*

Sir Charles Roberts (1860–1943), long hailed in Canada as the "father" of Canadian literature. He wrote poems in the traditional style, ranging through a wide variety of topic and mood, as well as novels, essays, and nature stories.

William Bliss Carman (1861–1929), a Canadian poet of major importance, whose chief works include *Low Tide on Grand Pré, Ballads of Lost Haven*, and *Pipes of Pan.*

Ernest Thompson Seton (1860–1946). An Englishman who was taken to Canada as a child, and lived for four years in the backwoods. In addition to achieving fame in the U.S.A. as founder of the Woodcraft League, a kind of anticipation of the Boy Scouts, he wrote several fine books on wild nature, including *Wild Animals I Have Known, Wild Animals at Home*, and *Lives of the Hunted*, also a standard work on *The Art Anatomy of Animals.* He illustrated many of his own books.

"**Ralph Connor,**" pseudonym of Charles William Gordon (1860–1937), clergyman, and writer of deservedly popular novels set amid the mining regions and lumber camps of West Canada. His most famous work was *The Sky Pilot*

Sir Gilbert Parker (1862–1932), Ontario-born novelist, who settled in England and added to his fame as a writer the distinction of sitting for eighteen years as M.P. for Gravesend, but continually drew upon Canadian memories for many of his novels, e.g. *Pierre and his People, You Never Know Your Luck.* Among the most memorable of his other books were *When Valmond Came to Pontiac, The Seats of the Mighty, Northern Lights, The Pomp of the Lavilettes*, and *The Right of Way.* He also wrote an excellent history of Old Quebec.

Stephen Leacock (1869–1944), English-born, but Canadian by long residence in Montreal, where he became head of the department of Economics and Social Science, McGill

Robert W. Service

Adam Lindsay Gordon

Katherine Mansfield

Olive Schreiner

University. As a writer of delightful humorous nonsense and burlesque he enjoyed wide appreciation on both sides of the Atlantic, especially with his *Nonsense Novels*, *Literary Lapses*, *Sunshine Sketches of a Little Town*, and *Moonbeams from the Larger Lunacy*. He also wrote text-books on economics.

John M'Crae (1872–1918), poet, particularly remembered for one moving lyric, the war-time poem "In Flanders Fields," originally contributed to *Punch*.

Robert William Service (born 1874), poet, popularly and somewhat unfairly called the Canadian Kipling. Such collections as *Songs of a Sourdough*, *Rhymes of a Rolling Stone*, and *Rhymes of a Red-Cross Man* contain verse that is at once masculine and melodious, depicting with vivid forthrightness the hard life of a wild North-West. He also wrote a fine tale of the Klondike goldfields, *The Trail of '98*.

Marjorie Pickthall (1883–1922), the most distinguished Canadian woman poet, whose sensitive verse can be found in *Drift of Pinions*, *Little Hearts*, and *Little Songs*.

Mazo de la Roche (born 1885), writer of a fine sequence of works about an Ontario family followed through several generations. The first was *Jalna* (1927); the most famous is *Whiteoaks*, which was made into a play.

AUSTRALIA

Charles Harpur (1817–68), the first distinctively Australian poet, whose most characteristic poem is "The Creek of the Four Graves."

Adam Lindsay Gordon (1833–70), poet, a Scotsman, born in the Azores and educated in England, who went to Australia at the age of twenty and spent his life there among horses, being in turn mounted trooper, horse-breaker, and steeplechase rider. His verse has always strongly appealed to Australians because it is full of action and adventure and gallant fighting against odds. He has depicted in vivid language all the excitement of a race meeting. His best and most characteristic work is in *Sea Spray and Smoke Drift*, *Ashtaroth*, and *Bush Ballads and Galloping Rhymes*.

James Brunton Stephens (1835–1902), a Queensland poet, now chiefly remembered outside Australia for his occasional comic verses.

Henry Clarence Kendall (1841–82), a poet who wrote of the bush almost as Wordsworth would have done, revealing a profound feeling for nature as revealed in the Australian scene. Some of his poems first appeared in *The Athenaeum*, the first English critical periodical of any standing to take notice of Australian poetry. His best work is contained in his *Leaves from Australian Forests* and *Songs from the Mountains*.

Andrew Barton Paterson (1864–1941), known as "Banjo" Paterson, whose "Man from Snowy River," written in 1895, is one of the best-known poems in Australia. His *Collected Poems* were published in 1921.

Marcus Clarke (1846–81), an emigrant from London, whose book *For the Term of his Natural Life*, published in 1874, was the first Australian novel to depict the days of the Australian penal settlements.

Thomas Alexander Browne (1826–1915), London-born, but taken to Australia at the age of four, becoming, in turn, pioneer squatter, police magistrate, and goldfields commissioner. Under the pen-name of "Rolf Boldrewood" he wrote several novels, of which *Robbery Under Arms*, telling the story of Captain Starlight, the notorious bushranger, remains a "classic" of its kind, and established his reputation in Great Britain as well as in Australia. It was published in 1888.

Mrs. Campbell Praed (1851–1935), author of some thirty novels.

Henry Hertzberg Lawson (1867–1922), author of *While the Billy Boils* (prose) and *In the Days When the World was Wide* (verse).

Helen Simpson (1897–1940), writer of many powerful novels, one of which, *Boomerang* (1932), was awarded the James Tait Memorial Prize. Others include *The Desolate House* (1930) and *Saraband for Dead Loves* (1935).

Ethel Florence Richardson (1870–1946), who wrote, under the pseudonym of **Henry Handel Richardson**, the novels *Maurice Guest*, *The Young Cosima*, and a trilogy collected as *The Fortunes of Richard Mahony*. Not only because of her pseudonym but also because it was supported by a vigorous, virile style, her work was for many years assumed to be that of a man.

C. J. Dennis (1876–1938), who presented the typical Australian city-dweller in his novel *The Sentimental Bloke*.

Xavier Herbert, contemporary novelist, whose *Capricornia* was awarded the Commonwealth literary prize for the best novel of 1937: with its scene set in Northern Australia around the beginning of the 20th century, it presents a brutal, but unforgettable picture of human evil-doing.

Christopher Brennan, contemporary poet, whose symbolism makes him virtually incomprehensible to all but the elect.

NEW ZEALAND

Alfred Domett (1811–87), friend of Robert Browning and "poet of the Maoris" who lived in New Zealand for thirty years, and described its scenery in a fine variety of lyric poetry, his longest poem being "Ranolf and Amohia."

Katherine Mansfield (1888–1923), writer of superb short stories in the manner of Tchekhov,

remarkable for their spare, clear-cut lines, their penetrating analysis of human motive, and their lively appreciation of the beauty of Nature. *Bliss*, *The Garden Party*, and *The Dove's Nest* are volumes which recall many phases of her New Zealand childhood. She moved to Great Britain, where she became the wife of John Middleton Murry, a well-known critic, and her fine work had a direct influence on the development of the English short story.

SOUTH AFRICA

Thomas Pringle (1789-1834), a Scots poet, who had already earned some reputation before settling in Cape Town in 1819 as government librarian. His finest long poem is *The Bechuana Boy*. He also wrote in prose a *Narrative of a Residence in South Africa*.

E. B. Watermayer (1824-67), poet, whose best-known poem is entitled "After a Storm."

Alfred Henry Haynes Bell, author of *The Last Stand*, a well-remembered example of a poem on the theme of empire-building.

Olive Schreiner (1862-1920), whose *Story of an African Farm*, published in London in 1883, under the pseudonym of "Ralph Iron," was a sensitive study which continued to attract English readers for very many years.

Sarah Gertrude Millen (b. 1889), who in *God's Step-Children* (1924) dealt searchingly with problems created by the contact of white and coloured peoples.

William Plomer (b. 1903), author of *I Speak of Africa*.

Edward Stuart Cloete (b. 1897), whose *Turning Wheels* (1937) was a study of Boer life which became a "best-seller" in Great Britain and the U.S.A. Later volumes include *Congo Song* and *The Third Way*.

Deneys Reitz (1882-1944), writer of three fine autobiographical books of adventure: *Trekking On*, *Commando*, and *No Outspan*.

Roy Campbell (b. 1901), the most distinguished of the later poets, possessing a strong sense of literary colour and an almost primitive vitality. His most striking works are *The Flaming Terrapin* (1924), *Adamastor* (1930), *The Georgiad* (a satire, 1931), and *The Flowering Rifle* (1939).

Jan Christian Smuts (1870-1950), South Africa's most distinguished soldier and statesman, and a figure of world-wide repute, also made a profound contribution to philosophical thought with his *Holism and Evolution* (1926).

The Centenary Book of South African Verse, published in 1925, included works by 68 writers.

BOOK LIST

General: *Cambridge History of English Literature* (15 vols.) and *Concise Cambridge History of English Literature* (1 vol.); *Chambers's Cyclopaedia of English Literature* (3 vols.); *Short History of English Literature*, G. Saintsbury (Macmillan); *The Background of English Literature*, H. J. C. Grierson (Chatto); *The Sources of English Literature*, A. Esdaile (Camb. Univ. P.); *Oxford Companion to English Literature*.

Verse and Prose: *Oxford Book of English Verse* and *Oxford Book of English Prose*; *The Art of Poetry*, W. P. Ker (Oxford); *An Historical Manual of English Prosody*, G. Saintsbury (Macmillan); *The English Novel*, W. Raleigh (Murray); *Aspects of the Novel*, E. M. Forster (Arnold); *English Prose Style*, H. Read (Bell).

Old and Middle English: *English Literature from Widsith to the Death of Chaucer*, A. R. Benham (Oxford); *Chaucer and His England*, G. G. Coulton (Methuen); *English Literature, Medieval*, W. P. Ker; *The Medieval Stage*, E. K. Chambers; *English Miracle Plays*, A. W. Pollard (Oxford); *The Age of Alfred*, *The Age of Chaucer*, *The Age of Transition*, J. F. Snell (Bell).

16th Century: *Oxford Book of 16th-Century Verse*; *Introduction to Tudor Drama*, F. S. Boas (Oxford); *Elizabethan Literature*, G. Saintsbury (Macmillan); *The Elizabethan Theatre*, E. K. Chambers (Oxford); *The Age of Shakespeare*, Seccombe and Allen (Bell).

Shakespeare: *The Essential Shakespeare*, J. Dover Wilson (Camb. Univ. P.); *Prefaces to Shakespeare*, Granville Barker (Sedgwick); *Shakespeare Primer*, E. Dowden; *Shakespeare*, W. Raleigh; *Shakespearean Tragedy*, A. C. Bradley (Macmillan); *Essays and Lectures on Shakespeare*, S. T. Coleridge; *Characters of Shakespeare's Plays*, W. Hazlitt (Dent); *Shakespeare's Workmanship*, Sir A. Quiller-Couch (Camb. Univ. P.); *Shakespeare at Work*, G. B. Harrison (Routledge); *Shakespeare*, Ivor Brown (Collins).

17th Century: *Oxford Book of 17th-Century Verse*; *Jacobean Poets*, E. Gosse; *Jacobean Drama*, U. Ellis-Fermor (Methuen); *Milton*, J. Bailey (Oxford); *The Age of Milton*, J. H. B. Masterman (Bell); *The Metaphysical Poets*, J. B. Leishman (Oxford); *History of Restoration Drama*, A. Nicoll; *The Age of Dryden*, R. Garnett (Bell).

18th Century: *Oxford Book of 18th-Century Verse*; *18th-Century Literature*, E. Gosse (Macmillan); *History of 18th-Century Drama*, A. Nicoll (Camb. Univ. P.); *The Age of Pope*, J. Dennis; *The Age of Johnson*, T. Seccombe (Bell).

19th Century: *Oxford Book of Regency Verse*; *Oxford Book of Victorian Verse*; *History of 19th-Century Literature*, G. Saintsbury (Macmillan); *The Age of Wordsworth*, C. H. Herford (Bell); *The Victorian Age in Literature*, G. K. Chesterton (Oxford); *The Age of Tennyson*, H. Walker (Bell); *Early Victorian Novelists*, Lord David Cecil (Constable).

20th Century: *Oxford Book of Modern Verse*; *20th-Century Literature, 1901-1940*, A. C. Ward (Methuen); *The Present Age, from 1914*, E. Muir (Cresset); *Poems of To-day* (Sidgwick); *Selections from Modern Poets*, ed. J. C. Squire (Secker); *Anthology of Modern Verse, 1920-40* (Methuen).

Overseas: *Oxford Book of American Verse*; *Oxford Book of Canadian Verse*; *Great Writers of America*, Erskine and Trent (Butterworth); *Cambridge History of American Literature*; *Centenary Book of South African Verse*.

BRITISH ISLES. Showing the political boundaries and the more important cities, towns, and ports. Principal mountain ranges also are indicated, and the main rivers, so important in industrial life, are traced and named. The Channel Islands form part of the British Isles although they lie so near to the French coast.

REGIONAL GEOGRAPHY

THE *main essentials of world geography, even of countries which have suffered most severely from political and military upheaval, remain largely unaltered from the geographic viewpoint. It is with these more permanent facts of Geography that this Course of Lessons is principally concerned. Folding maps in colour are included to illustrate the geography of two great regions—Europe and the Pacific area.*

For further information of a geographical character the student is referred to the companion Courses on PHYSICAL GEOGRAPHY (*Vol. 4*) *and* ECONOMIC GEOGRAPHY (*Vol. 3*).

37 LESSONS

LESSON 1

The Modern Study of Geography

Modern geographers take as their field of study the whole surface of the earth. To them, "surface" is not a two-dimensional figure but one which embraces three elements : the lower *atmosphere*, to a height of nine or ten miles ; the *hydrosphere*, including all still and running waters ; and the *lithosphere*, or rocky crust of the globe, extending to a depth of perhaps twenty miles.

Air, water, and earth are the essentials of man's physical environment ; and some geographers would define their subject as a study of man in his regional setting—as, in fact, human ecology.

From this it might appear that geography embraces all the sciences, physical, human, and social. But this is not so. Essentially, it is concerned with the *positions* of objects and the *location* of conditions on the earth's surface. Its fundamental inquiries are always : Where ? and Why ?

If one can ascertain the position on the earth of all the objects of a particular kind, e.g. glaciers, rice-fields, or Buddhist temples, one is able to speak of the *distribution* of these objects, that is to say, the distribution of glaciers, rice-growing, and Buddhism, over the globe.

Similarly, if one locates the various points where the annual rainfall is over 60 inches, or where blackwater fever is endemic, then one can speak of the world-distribution of heavy rainfall and of the incidence of that particular disease.

Comparison and Induction

Given maps showing the distributions of all the principal objects and conditions found on the earth's surface, one could write a very complete " Description of the Earth," which, as its name implies, is one of the tasks that geography should perform.

Modern geography aspires to do more than describe ; it seeks to explain, and to establish general principles by which the unknown can be argued from the known. The method is that of comparison and induction.

In several widely separated parts of the globe, for instance, the coastal inlets repeat the characteristic features of the Norwegian fjord All the regions with such inlets are elevated, all occur where there are evidences of past glaciation; therefore the hypothesis suggests itself that the peculiar features of a fjord are glacial in origin. This has been established by a study of the results of glacial erosion as it occurs to-day. Similarly, other types of coast can be classified and explained.

The method of experiment is, of course, closed to geography save to a very limited extent ; only by observing and comparing over a long period of time and over a wide area are established such relationships as that between rainfall and altitude, or between types of vegetation and the march of the seasons.

Since the geographer must wait on the processes of nature for his data, and since the field of his observations is constantly being arbitrarily transformed by human activity, it is small wonder that his subject is still largely in the empirical stage. It is idle to speak of " geographical laws," or to dogmatise about " geographical influences."

Interpreting a Landscape

Nevertheless, when any landscape taken at random over the face of the globe is examined, one becomes aware of a synthesis of geographical relationships which allows one to describe that landscape (including man and his works as among its elements) in rational terms as a unit of the earth's surface.

The plateau-like summits of the Cotswolds, and their steep scarp from which one may gaze across the Severn valley to the Malvern hills, are allied features of England which tell a clear tale of unseen, gently tilted limestone beds. This limestone plateau is dry underfoot and, with its red-brown marly soil, is admirable for wheat and sheep, twin pillars of old English farming.

Remains of numerous Roman villas, traces of Roman roads, Early Perpendicular churches of noble design, handsome stone-built farmhouses with great barns and stockyards, stone walls separating wide fields, villages aligned to the regularly spaced spring-heads or tucked away in sheltered combes—all these can be related to the fundamental crustal structure.

Turn now to the swamps of East Poland. There each islet of blown sand or mud or peat that rises a few feet above the water level is the site of a poor village and its still poorer fields. Long-legged, razor-backed pigs and skinny fowls wander about the deeply mired village street and through the yards of the mud-floored timber-built cottages, in which a wooden bench and wooden bed are the sole furniture.

A Synthesis of Relationships

Home-made tools, gear, and implements, shapeless clothing of homespun hemp and sheepskin, a diet of potatoes cooked in crude crocks made by the village potter—save for the fair skins and fair hair of the villagers, the stranger might believe himself to be in primitive

Africa. But the individuality, like the poverty, of the landscape hinges upon one geographical fact: from the almost dead level surface the water can only imperceptibly drain away.

A paradise for storks, for fish and water-fowl, the waters of the Pripet marshes dwindle away under the summer sun and, in favoured localities, green meadows stand revealed for a few months from which are carried away astounding hay crops. When some of these meadows remained awash in high summer, an uneasy feeling arose that the huge Russian dam on the Dnieper at Zaporozhe was holding up the water, for the overflow of the swamp passes that way to the sea.

The opposite fear was felt at Montreal when it seemed that the people of Chicago, by cutting their great drainage canal towards the south, were robbing the Canadian river-port by just a few critical feet of its essential deep-water harbour.

Such dangers are a reminder that although geographers may mark out unit landscapes and politicians may delimit boundaries, the earth's surface is, in fact, itself a unit, a synthesis of relationships extending over the whole of it, which cannot safely be disturbed by random acts.

It may be necessary to seek the cause of a famine in India in the weather surges round the South Pole, and its consequence in the machine-shops of Belgium. The salvation of China may be the disaster of Peru in terms of geography.

Historical Geography

All landscapes change, whether rhythmically with the seasons or progressively with the march of geological time or irregularly with the changing ideas and circumstances of mankind. The distribution of water and dry land, of plants and animals, fields and villages, in the English Fenland to-day is completely different from that of three hundred years ago.

Distributions of phenomena over the surface of the globe and analyses of landscapes must therefore be related to a period of time, and the reconstruction of past distributions, leading to a comparison with those of the present, is the task of historical geography.

It is possible to gain, for example, strong proof of the unvarying character and real importance of surface relief when one learns that those sites upon which towns of first importance have arisen in modern Italy were also the very sites selected as key positions for occupation by the Etruscans of nearly 3,000 years ago.

The study and analysis of town sites, and of population distribution generally, form one of the most fascinating branches of geography, and the conclusions that can be drawn from such a study are far from being of purely academic interest.

One of the most amazing and deeply disturbing facts about the earth's surface to-day is that three-fourths of its inhabitants are crammed into the limited spaces of Europe and Monsoon Asia. The days of folk-wandering are past, and if a catastrophe is to be avoided redistribution of population must be deliberate, the fruit of far-seeing regional, national, and even world planning. In effecting such a redistribution, geographical considerations, major and minor, must be of first importance. Geography is a dynamic study.

Mere travelling about the world does not make a geographer: the eye sees only what it is trained to see, and the pen can record only that for which the writer has a name. A systematic training based upon a systematic arrangement of subject-matter is essential, and the more so that the geographer's task often consists of interpreting in their distributional aspects the observations of other specialists such as geologists, botanists, statisticians, whose data are collected with a different object.

Climatic Influences

The study of the atmosphere as a separate science belongs to the meteorologist, and his day-to-day forecasts of weather are of importance. Climate may be defined as the totality of the weather seen in perspective; and the variations of climate the world over, that is to say, climatic distributions, are of special interest to the geographer.

His point of view differs from that of the meteorologist, who seeks to establish normal and periodic values for the climatic elements, since it is the departures from normal that affect plant and animal and human life upon the globe.

It may, for example, be useful to know that the average rainfall of a certain place is only two inches a year; it is more vital to know that six or seven totally dry years may be followed by a year when torrential rains fill the dry gullies, sweep away embankments, destroy roads, and wreak destruction on all sides.

Similarly, a knowledge of the mean wind strength in Yucatan may contribute to the solution of the general problem of atmospheric circulation; but as it is an area where wind pumps are installed for raising water, statistics of wind reliability will help to decide the size of the storage tank.

World climates, climate types, climate variability, the relation of climate to topography, climatic changes through historical and geological time—all these enter vitally into the complete and reasoned description of the world's landscapes: every landscape is conditioned by climate.

Turning from the atmosphere to the lithosphere, no visible element of landscape is more fundamental than the diversities of surface

relief. Why is it that there is here a mountain chain extending for thousands of miles, here a monotonous plain of even greater dimensions? Why do people insure against earthquake risks in this city and not in that? Why are some hills flat-topped like tables, others rounded like a whale's back, others serrated like a giant saw?

It is the task of geomorphology to show how the character of the underlying rocks, the way they are arranged, the processes by which they have been weathered or eroded, and the length of time that they have been exposed to erosion, all play their part in determining the contours of the earth's surface.

Geomorphology may be called the anatomy of landscape, and to those trained in its principles a view that was once a meaningless jumble of hills and valleys resolves itself into a logical whole, with a history that can be traced back into the past and forward into the future.

Hydrology

The study of lakes and rivers, underground springs, wells, and streams can hardly be separated from that of land forms, for running waters play a leading part in imposing varied ridge and valley patterns upon the surface of the earth, while waters percolating underground often play a decisive part in the distribution of living things, whether plants, animals, or men.

The mean and minimum flow of rivers and their liability to flood are intimately bound up with climate and with surface contours; no less intimately do they affect the usefulness of rivers to mankind. It has sometimes been said that geography is the study of the earth as a macrocosm, a giant organism. If geomorphology teaches its anatomy, then hydrology teaches its circulation.

All the rivers flow into the sea and yet the sea is not full, for evaporation withdraws just so much water into the atmosphere as, re-precipitated in the form of rain and snow, will maintain the rivers at their normal flow. During the Great Ice Age the balance was not maintained, and the oceans shrank, with the result that almost everywhere the landscape changed, for the oceans are a potent factor in dictating the kind of climate that neighbouring lands will experience.

Flora and Fauna

Aided by the wind, they transfer incredible quantities of heat from the tropics nearly to the Poles. The clue to the history of the Vikings or Norsemen, and to the geography of their raids, discoveries, and settlements, must be sought in the findings of oceanography.

Where there are air and earth and water, there also are life forms, plants, animals, and men. The botanist is interested in plants in themselves, and in the adaptation they show to environment. The geographer is interested in plants as mass formations, as forests, as savannas, as jungle, as desert scrub. The natural vegetation sets a stamp of individuality upon a landscape, gives a strong hint as to what might be its human use, and in some parts of the world still sets a limit to penetration and occupation of empty regions.

The distribution of animals would at first seem of much less concern to the geographer than that of plants, but on reflection one recalls that the location of fisheries, and the great reserves of furred animals (to name but two examples) have been potent factors in the promotion of human settlement. The geographical problems of Africa cannot be understood if one neglects to examine the distribution of the tsetse fly.

Geography of Mankind

Geography must of necessity take cognisance also of the findings of the anthropologists: statistics of measurement of individual somatic qualities can be mapped as a series of world distributions.

The geography of mankind is much more than a study of the shape of man's head, the colour of his skin, or the folding of his eyelid. It is a study of man in so far as he leaves his imprint upon the landscape. He destroys natural vegetation, tills fields, opens mines and quarries, herds animals, builds settlements, makes roads and other trackways. All of these evidences of man's restless activity may be viewed and mapped in their distributional aspects, and discussed in their relations to surface, relief, and climate. They may be conveniently classified into productive, unproductive, and destructive occupation of the soil.

A map of the world, or of a region, or even of a small district, showing where man has played a destructive rôle, whether in exterminating whales, in exhausting soils, in laying waste forests, in letting loose some pest, or in a score of other ways, would shock everyone and go far to prepare the way for a properly planned and geographically based economy.

Natural Resources

One of the first tasks of economic geography is a survey of natural resources. These include fisheries, forests, mines, soils, waterways, and where a planned economy is in question it is vital to review first the bases of industry: power locked up in coal, peat, oil, or running water, iron and copper ores, the fundamental chemical salts, and so on.

The distribution of these is not purely arbitrary; it is intimately linked with the structure of the region concerned. Coal measures, for example, mark a long-vanished shore line, oil fields are frequent on the forelands of the "young" mountain chains. Gold,

with its artificial potency, derives ultimately only from very ancient rocks ; aluminium is a constituent of common clay.

The geography of crop distribution is an enormous subject, and with many ramifications : upon the distribution of food crops depends the distribution of settlement, upon the distribution of fodder crops the distribution of farm animals, and upon the distribution of industrial crops, such as the fibres, the distribution of industry.

Behind the distribution of crops lies, besides the purely human factor, the distribution of climate and soil. Soil study, or *pedology*, has taken on a new interest, for the texture and mineral content of the different classes of soil have been found to be themselves a function of climate, acting both directly and through the medium of the natural vegetation cover. The question of the distribution of reserves of natural fertilizers—nitrate, phosphate, and potash salts—is also a geographical one, as is that of areas of actual or potential irrigation.

Geographical Inertia

The distribution of industry is linked with the distribution of power resources, of raw materials, including industrial crops, of labour supply, and of markets. It is in part determined by, and in part determines, the location of dense settlement of population, and leads on naturally to a consideration of the geography of transport.

Roads and railways must take cognisance of surface relief as it affects gradients ; shipping routes must take their direction in accordance with the location of deep-water harbours and the demands of freight; air routes must be related to landing grounds, and refitting and refuelling stations.

All alike, therefore, have strictly geographical aspects as well as commercial ones. Transport has trade for its purpose, and as regards trade there is abundant statistical material collected by almost every country, from which the world movement of commodities and the world distribution of supply and demand can be deduced.

Every element of a landscape, every condition even which influences it, is liable to change Hence the earth's surface, and the landscapes into which it may be resolved, must be studied constantly in their evolutionary and historical aspects.

The distribution of population and the location of settlement in the past, the distribution of natural resources and crops in the past, the distribution of land and sea routes, of trade and industry, all of these not only have their immediate interest as having formed a leading condition of past social and political history, but have played their part in determining the distributions of the present, owing to what is sometimes termed *geographical inertia.* Supposing Britain were virgin soil to-day, an uninhabited island, to be colonised from America, where would its capital city be placed ? What crops would it grow ? What industries would it develop ?

Political Geography

While the geographer surveys the whole surface of the earth with equal eye, as the environment of mankind, he cannot ignore the fact that it does not function freely as a unit. Peoples are settled, resources are assessed, industries are developed, within political boundaries ; no matter if they differ in language, in culture or religion, the people within the limits of a particular government are theoretically a nation, and may be so welded together by common sentiment, loyalty, and tradition, that they are a nation indeed.

The distribution of states, their size and frontiers, and the distribution of the whole sequence of geographical phenomena, as they occur within the boundaries of states and their dependencies, is the field of political geography.

Regional Geography

The notion of a "region," an area over which the elements of the landscape, both physical and human, are broadly uniform, is quite familiar. One speaks of the Alpine region, the Prairie region of Canada, the Saharan region, and so on, with reference to quite well-defined units. The geographer seeks to extend this natural recognition of regions into an exact system of subdivision and classification of the whole surface of the earth.

While he recognizes that no two regions are identical, he groups them as of the same type, e g. the Canadian and Siberian forested plains, the Californian and Central Chilean valleys, the Breton and the Cornish peninsulas. The last pair are regions of a minor order, and it is possible, indeed, to subdivide our regions again and again until one arrives at an indivisible unit landscape. Within the Wealden region of Kent, Surrey, and Sussex, for instance, there are the downland, the clay vales, the forest ridges, easy to differentiate.

A country within which there is a strong regional differentiation is likely to be a country with a variety of natural resources, a variety of industries, a variety of experiences and aptitudes among its people.

LESSON 2

Main Physical Features of Europe

The low-lying tableland of European Russia is bounded on the south-west by a line connecting the south-east corner of the Baltic and the north-west corner of the Black Sea, the distance in a direct line being just over 700 miles. If Europe is regarded as a peninsula of the great Eurasian continent rather than an independent continent, the arbitrary dividing line just described will be the most suitable.

From the body of this peninsula, formed by Central Europe and France, three peninsulas project southwards (the Iberian, Italian, and Balkan) and one northward (Jutland) The British archipelago was also once a peninsula, extending north from France. From the north-west corner of Russia the Scandinavian peninsula extends south-west towards Jutland and the Danish isles, almost enclosing the Baltic

When the known world hardly extended beyond the Mediterranean, the much-indented coastline and the many islands of that sea greatly facilitated not only trade but also the spread of Greek civilization and Roman rule. During the Middle Ages, European trade with the East was in the hands of the seamen of the Italian mercantile cities, particularly those of Venice, Genoa, and Pisa.

The great discoveries, beginning with the discovery of America by Columbus (1492) and of the sea route to India by Vasco da Gama (1497), gave the Atlantic coastlands their chance, resulting in a struggle for possession of the new territories, west and east, which lasted nearly 300 years and involved Portugal, Spain, France, Holland, and England.

When the greater part of North America and practically all South America, just before or soon after 1800, freed themselves from European rule these west European countries found themselves favourably placed for trans-atlantic commerce, and also able to take their share in the development of world trade which had followed the opening-up of Africa, and the establishment of Britain's self-governing dominions

Mountain and Plain

A striking feature of the land surfaces of Europe is the system of folded mountain ranges on or near the shores of the Mediterranean These folds were produced by pressure from the sides due to movement of portions of the earth's crust The result is one or more mountain ranges, by no means always of equal height but frequently more or less parallel to one another

The chief fact to be noted in connexion with the mountain ranges is the cutting off from Central Europe of the three southern peninsulas by three of these ranges, the Pyrenees, Alps, and Balkans. Of these the Pyrenees are the narrowest and also the most continuous, with very few good passes, and therefore not easy to cross. Historical geography supplies a striking illustration of this, in that the political frontier between France and Spain has experienced fewer changes than probably any other European frontier.

The Alps, although wide, are much better supplied with passes, and consequently the countries immediately north and south of them have frequently found themselves under one and the same ruler Switzerland extends from the hill country of Central Europe right across the Alps to the foothills adjoining the low-lying plain of North Italy.

Another feature, confined chiefly to the region of the Mediterranean, is the number of alluvial plains, formed of soil or sand brought down by mountain streams, carried along and deposited by the slow-moving rivers of the lowland. Two of these plains, that of Hungary and the plain of Lombardy, are actually enclosed between portions of the mountain system.

Of the others one might mention the plain of the Ebro (Spain), where the kingdom of Aragon had its beginnings ; the fertile valley of the Garonne, virtually coinciding with the province of Gascony, once under English rule ; and the Rhône valley which, continued north of Lyons in the Saône valley, has been from the earliest times an important route between north-western Europe and the south of France, with its harbour of Marseilles.

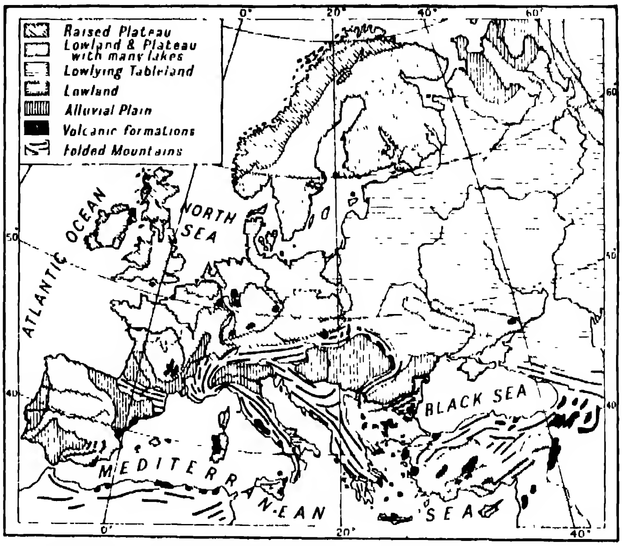
The hill country of Central Europe was originally a raised plateau region which extended from central France along the whole northern flank of the Alps to the Russian tableland. Numerous rivers have been at work for long ages and have left standing only some blocks of harder material, mostly however of such comparatively small extent that the valleys between them not only afford easy communication in all directions but themselves contain wide stretches of fertile country.

Norway and Scotland show a similar origin, though here the work of the rivers has not been quite so effective. In Norway especially there has been a sinking of the land, which turned valleys into long, narrow inlets called fjords. Another region of similar formation fills the greater part of the Spanish peninsula. As shown by the direction of its rivers, it is

tilted slightly from east to west, and it is fringed south and west by a fertile, alluvial plain of varying width.

The north-western plain extends from the Bay of Biscay through northern France and the Low Countries (Holland and Belgium) as far as eastern Germany, and includes Denmark and the extreme south of Sweden. A similar formation occupies south-eastern England. At its narrowest it is on Belgian territory, which is the main reason why Belgium has been one of the chief battlegrounds of European history.

In Europe the sea penetrates deeply into the land, both north and south. The Mediterranean on the south is land-locked but for the narrow strait of Gibraltar. The Dardanelles, the Sea of Marmora, and the Bosporus lead to the Black Sea and the Sea of Azov. The Caspian is entirely land-locked, the Baltic is almost so, its only connexion with the North Sea being by straits between Sweden and Denmark.



EUROPE. Map showing aspects of its physical geography.

A consideration of climatic conditions places the eastern boundary of peninsular Europe rather to the west of the boundary described at the beginning of this Lesson, as the long severe winters, hot summers, and scanty rainfall of the Soviet Union extend well into central Germany. France, the British Isles, southern Norway and, to a lesser degree, the Low Countries and western Germany, are under the moderating influences of the prevailing west winds, which have crossed the relatively warm waters of the North Atlantic Drift (the northern continuation of the Gulf Stream). The rest of Europe, belongs to the Mediterranean region, which is chiefly characterised by winter rains and summer droughts.

LESSON 3

Physical Features of the British Isles

The British Isles are an archipelago situated to the north-west of Central Europe, to which they were once joined. This is illustrated by two important geographical facts The British Isles stand on what is called the Continental Shelf.

The seas between them and the Continent are nowhere more than 600 feet deep, so that if the level of the sea were to sink by 600 feet the British Isles would be surrounded by dry land joining them to the Continent. On the outer side (towards the Atlantic) the depth of the sea increases considerably in a short distance.

The structural formation of the British Isles is a continuation of that of Central Europe. To the north-east the Scottish islands formed stepping-stones for Scandinavian invaders, who have left strong evidence of their presence in blood, language, and customs.

The east coast with its estuaries, such as the Humber, Wash, and Thames, faces that part of the Continent from which came Danes and Saxons. The south coast lies temptingly open to invaders coming up the Channel or across it

The archipelago consists of two large (Great Britain, the largest island in Europe, and Ireland) and about 5,000 smaller islands and islets. The west coasts of Ireland and Scotland are much indented and have several fine natural harbours. Commercially, however, these are of no great value, because nowhere have they anything in the nature of an industrial hinterland.

Very different are the river estuaries such as Belfast Lough, Clyde, Forth, Tees, Humber, Thames, Severn, and Mersey. These are of enormous economic advantage, as they not only bring the moderating influence of the sea to bear on inland climatic conditions but also bring sea traffic to the door of big inland centres

A line connecting the mouth of the Exe (Exmouth) with the mouth of the Tees (Middlesbrough) separates Britain into two major natural divisions : a highland region to the north and west, a lowland area to the south and

east. The difference is not merely one of height. The highland region is formed of very old igneous or crystalline rocks, together with limestones, sandstones, and other geologically ancient rocks.

Being generally very hard, these old rocks are not greatly affected by the erosive action of rain, ice, or the sea. Consequently this is the highest part of Britain. Lowlands are few and small, the soil is nowhere very rich or fertile, and the population is scanty.

Upland Regions

It is possible to distinguish three upland regions, namely (1) the Scottish Highlands, separated by Forth and Clyde from (2) the central highlands, which extend south into the English Midlands, and are separated by the plain of South Lancashire and Cheshire from (3) the south-western highlands.

The *Scottish Highlands* are a well-marked natural region, surrounded on three sides by the sea, and bounded on the fourth (south-eastern) side by a line drawn from the mouth of the Clyde to a point on the east coast some 20 miles south of Aberdeen. The west coast has sunk and the sea has drowned the long narrow valleys, turning them into fjord-like sea lochs in a coast fringed with many islands.

The interior is a land of heather moors, above which rise heights of from 3,000 to 4,000 feet above sea level. Communication is difficult, which has led to the growth and preservation of strong clan feelings. Glenmore, the glen extending from Fort William to Inverness and containing three long, narrow lakes joined by the Caledonian canal, is a fine natural highway, but passing through sparsely peopled country. Near its southern end is Ben Nevis (4,406 feet), the highest mountain in the British Isles. The highest elevations in the eastern highlands are in the Grampians and Cairngorm mountains.

The *central highlands* comprise the uplands of Southern Scotland, the Cheviots, Pennines, and hills of the Lake District. But the whole really forms a single natural region, in which communications are generally not easy, while the poor soil makes it unfit for anything beyond sheep farming—except where the discovery of mineral resources has made industrial development possible.

The Tyne gap, traversed once by a Roman wall, now by the Newcastle-Carlisle railway, separates Cheviots and Pennines. The latter extend south to the Trent valley, accompanied on the west by the plain of Lancashire and Cheshire, on the east by the plain of Yorkshire.

They are joined by Shap Fell to the hills of the Lake District, which owe much of their beauty to former volcanic action. Thus the highest peak in England, Scafell Pike (3,210 feet)

BRITISH ISLES. Highlands and lowlands, with indications of geological formations. *See also* **the Course GEOLOGY.**

consists of volcanic ash compressed into very hard rock. The valleys with their lakes radiate from the centre like the spokes of a wheel. Farther south the Pennines are broken by their only real gap, that formed by the river Aire and traversed by the Liverpool-Leeds canal.

The region of the *south-western highlands* would include Wales, separated by the Bristol Channel from the hills of Devon and Cornwall. The Welsh highlands form a solid mass from north to south, nearly everywhere over 1,000 feet high, but deeply cut by rivers, in whose valleys, especially in the coal district of the south, the population has collected. Several of the Welsh rivers, such as Dee, Severn, and Wye, rise quite near to the west coast and flow east.

Great Britain's longest river, the Severn (220 miles) rises only 20 miles from the sea and flows north-east and east before turning south to the Bristol Channel. Snowdon, in the north-west, the highest mountain in England and Wales, rising to 3,560 feet, is remarkable for the manner in which it is surrounded by deeply-cut glaciated valleys, traversed by roads of easy gradient.

Beyond the Bristol Channel the south-western peninsula is occupied by Exmoor, Dartmoor, Bodmin Moor, and the Cornish

hills. Between them are broad, fertile, well-cultivated valleys. The watershed is generally near the north coast, as the two chief rivers, Tamar and Exe, rise within a few miles of the Bristol Channel.

The isolated Mendip Hills, though lying just to the east of our imaginary Exe-Tees line, belong by their structure rather to the region west of that line. They form the starting point of the separation of industrial from agricultural England.

The high land of the north, west, and south of Ireland surrounding the central lowland is generally similar in origin to much of the British highland, but it has been much more worn down by the action of water and ice. Instead of extensive blocks, as in Wales, the highland regions of Ireland are further broken up by rivers radiating from the lowland.

A striking difference is presented by the mountains of Antrim, in the extreme north-east, which are of comparatively recent volcanic origin, the chalk or limestone being covered by black volcanic rock. The Giant's Causeway near Portrush, like the Isle of Staffa, near Mull, off the west coast of Scotland, is formed of lava which has cooled into regular, hexagonal-shaped columns of basalt.

LESSON 4

England and Wales: A General Survey

In times past it was customary to speak of England and Wales as if together they consisted of an industrial and relatively grim and grimy north and an agricultural and pleasantly social south. This distinction was later modified into a separation between industrial England of the north and west and agricultural England of south and south-east.

Geographers pointed out that this division coincided with a definite difference in physical structure along what is known as the Exe-Tees line, which roughly separates the hilly districts in which lie the coalfields from the clay vales and smooth downs of limestone and chalk where farming is easier

It was also pointed out that the south-eastern corner of England suffered less from the prevalent cloudiness and rains which beset England from the Atlantic Ocean and, despite the colder continental winds, enjoyed climatic advantages denied the humid north-west.

So sharp a division into two areas was emphasised throughout the development of the basic industries of coal and iron, cotton and wool. Dense populations clustered in urban nuclei wherever work was plentiful in mine and mill, and work was available because during this time British coal and ships, British cottons and woollens, were in active demand throughout the world. Coincidently with the vigorous growth in industry, the prairie lands of Canada, Australia, the U.S.A., and the Argentine were able to send to England the additional food, wheat, and meat required to supplement the home supplies.

The Growing Metropolis

Throughout this geographical change in the relative importance of these two areas—growth in the distant confines of the land, and stagnation, if not relative decline, in the Home Counties—the capital, London, was a centre for social and political life and by reason of the unique financial character of "the City" the world's centre for finance.

Changes in the rest of the world, England's gradual loss of industrial supremacy—a supremacy mainly due to priority coupled with the remarkable advance in the development of machinery and the sources of power which maintain its motion, are being reflected in England itself, for the south-eastern corner has been acquiring a new importance and the Exe-Tees line becoming somewhat less significant as the factories and workshops move south.

New factories which are not tied down to coal as a direct source of power or as a raw material are being located within the bounds of the ever-growing Greater London, while an industry like the pottery manufacture of North Staffordshire tends to remain tied to the coalfield, coal for the kilns being a dominant factor in the cost of manufacture.

London, then, is steadily increasing its importance. It is at the centre of the land hemisphere; it is situated at the head of a long tidal estuary, well scoured by the tides whose scouring force is maintained by the shallowness of the British seas over the Continental Shelf.

It gains over, e.g. Paris or Berlin by the fact that the greatest of cargo ships can unload within its docks; it gains over New York by the fact that it has room for almost indefinite expansion and is not hemmed in by land barriers which hinder communication; its climate is one of the best for energetic and consistent activity. The population of the administrative county of London was 3,348,000 in 1951; that of Greater London was 8,346,000.

London is definitely the centre and heart of England, so let us take a radial sweep around it. In the south-east is Kent, England's garden, with its sheep and its market gardens and orchards inland, and its coastal activities along

the Thames, ranging from cement and paper-making to catering for visitors, and with its cross-Channel ports, Dover and Folkestone.

Swinging west one sweeps through Sussex, with a ferry at Newhaven, seaside dormitories and playgrounds for London workers at Eastbourne and Brighton, and its market gardens, notably near Worthing.

Our radial arm lengthens westward through Hampshire, mainly over farm land, with London's mighty outport, a creation of the railway, at Southampton (pop. in 1952 was 178,300), its naval fortress at Portsmouth (233,400), and pleasure resorts at Bournemouth (144,700) and in the Isle of Wight. The rise of Southampton at the expense of Liverpool is another sign of the shifting of England's interests to the south.

Having crossed Surrey, and having passed over the North and South Downs, with the intervening Weald, over Romney Marsh and the vales of Kent and Sussex, and across the Hampshire basin, which includes the New Forest and the vale of Dorset, one comes to the edge of the western Downs, which include the military training area of Salisbury Plain.

Such is south-east England, a pleasantly varied land with a pleasing rural landscape of woodland and farmland, where the folk are mainly interested in what Londoners will buy of their produce. Along the railways and the roads, trucks and lorries carry milk, fruit, flowers, and vegetables for the markets of the metropolis and meat from overseas.

The West Country

One now moves across the south-western peninsula between the English and Bristol Channels, with its outposts the Scilly Isles, whence, because of a mild climate and early Spring, early blooms and vegetables can be sent to London. Here are older rocks with their bleak moorland surfaces, Dartmoor, Exmoor, and Bodmin Moor, and their cliff coasts and deeply-incised valleys and lanes. Plymouth (218,600), Falmouth, and Exeter (76,600), remind us of ancient days. Torquay, Newquay, and Ilfracombe are holiday resorts.

Here are quarrying industries for slate at Delabole, tin in varying quantities, and china clay (kaolin) ; here are red Devon fields, red cattle, and red (cider) apples. Nearer London are the Vale of Taunton and the plain of Somerset, and across the Mendips the Avon valley and Bath and Bristol, where for centuries ships from the West Indies and the rest of the Americas have unloaded tobacco and sugar.

The radial arm now stretches due west from London through Bristol (443,900), via Reading (115,800), and on to Cardiff (244,800), and Glamorgan. Reading with its biscuits and its seeds bespeaks the farming neighbourhood of Berkshire and Wiltshire, whence dairying extends through Somerset to Devon.

Industrial Wales

Cardiff stands for the South Wales coalfield. This industrial district was uniquely based upon coal exporting, and an early iron industry at Merthyr Tydfil. The coal ships served the coaling ports of the world with Welsh steam coal, and for return cargoes brought ores of tin and copper and iron for the metallurgical industries—the smelting of copper and tin, the manufacture of tinplate and galvanised goods, relatively a one-sided development which gathered the people of Wales into the valleys of inland Glamorgan and gave them prosperity just so long as the ships needed the coal and as the world would buy Welsh tinplate and Welsh metals in quantity.

The change-over to oil-burning ships witnessed a recession in the coal trade, but after a period of depression during the inter-war years, coal production started to rise again. The steel and tinplate industries have been reinforced by mammoth new plants at Port Talbot and Llanelly, the refining of oil at Skewen (Swansea) continues to expand, and the basic industries have been further augmented by numerous light industrial establishments. Over half of the population of Wales is in the industrial south. Here are Swansea (160,400), Llanelly, Newport Rhondda (109,800), and Barry, and on the far coast Fishguard, a packet-station for Ireland.

Crossing Wales, one comes to rest at Holyhead, the older Irish packet-station ; one has crossed the Cambrian mountains and finished at Snowdon. A dissected country this, of old hard rock, whence flow the Wye, Severn, and Dee to the lowland that separates Wales from England. Wales supports throughout this section a scanty population, indicated by the absence of trading towns and harbours of importance on Cardigan Bay.

Our tour in England crossed Herefordshire, noted for fruit, from end to end, along the Cotswolds with its sheep walks, across the Upper Thames basin and by Oxford (107,100), where members of one of the oldest universities jostle in the streets workers in the great motor works which owes its location to one man's pertinacity. Nearer home it has swept over the Chilterns and noted the radiating roads and railways which converge on London.

Our sweep has swung through more than half a circle and our thoughts are now carried from the Thames estuary northwards. One starts from the Essex shore and swings through a quarter of a circle until the arm points almost due north through Hull to the coast of Yorkshire in the neighbourhood of the holiday resorts, Scarborough and Whitby.

Along the coast one passes Southend (151,500),

a London dormitory ; Harwich, with Parkeston Quay, a ferry town for the Continent ; Lowestoft and Yarmouth, fishing centres for the Dogger Bank ; the Wash, the shallow water-covered extension of the Fens, to the Humber. Here, on the south bank, are Grimsby (93,200), a fishery centre ; Immingham, with its docks ; and on the north bank, Hull (299,400), an outlet for textiles made nearby and an inlet for raw wool, iron ore, and pit props for the workshops and mines, and for foodstuffs.

Here is a centre for lubricating and other oils needed for machines and manufactures, for wheat for the flour mills, and for flax, timber, seed, nitrates, etc., which are gathered by Hull liners from almost all the ports of the world.

With the exception of industrial South Wales our two sweeps have covered agricultural England and Wales, a comparatively quiet land of rural interests and small country towns and a moderate, evenly-spread population ; there are a few coal pits in Kent.

The Industrial North

The rest of England, the north and the southern portion lying between the lines from London to Holyhead and London to Hull, an eighth section of a circular sweep, is industrial England, and here are main roads, railways, and canals which converge on London and are criss-crossed by many connexions.

Roughly half the area is composed of the Pennines, the backbone of northern England, the southern portion of the central highlands. On it is rough moorland on which sheep are grazed, and against the steep-sided flanks of the range lie the cotton towns of south-east Lancashire and the woollen towns of the West Riding of Yorkshire. Each of these factory districts is based upon a coalfield.

At the northern corners of the Pennines lie two other coalfields—that of Cumberland on the west and of Northumberland and Durham on the east. South of these coalfields are the ironfields, that of Furness upon the west and that of Cleveland on the east. More recently other fields of iron ore have been developed in Northamptonshire (Corby) and Lincolnshire (Frodingham and Scunthorpe).

The Furness iron is responsible for the shipbuilding of Barrow (65,370). The Cleveland iron accounts for the iron and steel industries of Tees-side and the shipbuilding of Tyneside and, with the coal exporting of Newcastle (292,000), it gave rise to a concentration of population in many towns which line the Tyne and the coast.

The West Riding woollens, with the coal of the York, Derby, and Nottingham coalfield, form an industrial nucleus for the activities of Leeds and Bradford (pops. in 1951 were 505,000 and 292,000 respectively) and their neighbours. The iron of the south and iron imported from Sweden, West Africa, Labrador, and Spain are responsible for the cutlery and heavy steel goods of Sheffield.

Farther south lie Nottingham (306,650), Derby (141,000), Leicester (285,000), Loughborough, and Northampton—all on the easterly routes to London. The Lancashire cottons created a prosperity which in the 19th century allowed Manchester (705,400) and Liverpool (791,500) to become sufficiently powerful to dictate much English commercial policy.

This caused an agglomeration of over ten millions of people within a small area to form one of the most densely peopled manufacturing areas in the world. They were wealthy enough to build the Manchester Ship Canal and thereby make Manchester an inland seaport

To the south the western route goes through the Potteries and the Black Country, the seat of the metallurgical products commonly known as Brummagem wares ; here, naturally, are most of the motor-car factories. Birmingham in 1952 had a population of 1,119,000.

The Vale of York and the Cheshire Plain are parallel lowlands, both interested mainly in provisioning the millions who work in the factories near. In Cheshire the salt mines are responsible for the growth of a vast chemical industry with which has become associated the manufacture of soap and allied products, based upon the import at Liverpool of the necessary fatty substances from various parts of the world Industry has begun to extend south of the Midlands, and this extension brings us back to London, the metropolis and nerve centre.

Situated in the Irish Sea, some 27 miles from the English coast and rather less from the Scottish, is the Isle of Man, a self-governing unit of the British Commonwealth. Its area is 227 sq. miles, and its population in 1951 was some 54,500. Douglas (pop. 20,300) is the principal town ; Ramsey, Peel, and Castletown are other centres. Agriculture and fisheries are the chief occupations, and wheat and cattle are exported to England. The island is also a holiday resort, drawing large crowds every year from industrial districts on the mainland

The Channel Islands are much nearer to France than they are to England, and because of this they were the only part of the British homeland to be occupied by the Germans in the Second World War. They consist of Jersey, Guernsey, Alderney, and Sark, and their total area is 75 sq. miles, with a population of some 102,000, swollen by thousands of visitors.

Early vegetables and fruit and spring flowers are their normal produce, mainly for the London market. The English language is generally used in the larger towns, such as St Helier, capital of Jersey, and St. Peter Port, capital of Guernsey, but the official language is French. The Channel Islands are self-governing.

LESSON 5

Highlands and Lowlands of Scotland

SCOTLAND as a country is hillier, rainier, and somewhat colder than England. As it is farther north its summer days are longer than those of England, yet the increase does not entirely compensate, save where the aspect is southerly, for the coldness of the higher latitudes.

The west coast is more exposed to the oceanic waters, and its many indentations add to the length of land warmed in winter by the warm, moist winds from off the sea waters, so that Wick in the north is as warm in January as Brighton in Sussex.

In a rough fashion Scotland may be paralleled, on a slightly smaller scale, by parts of its southern partner- central Wales corresponding with the Highlands, the plain of Cheshire and south-east Lancashire with the Central Lowlands, the Pennines with the Southern Uplands. In both areas the higher ground is of very little use save for sheep ; in both, the lowlands are more fitted for pasture than arable, and they contain coal deposits which are the prime reason for their relatively dense population.

The parallel breaks down when one comes to the main interests of the people, for Lancashire has tended to a one-sided sectional growth based mainly on cotton textiles, coal, and chemicals, while the Midland Valley of Scotland has seen the concentration in a small area of all kinds of industry.

The Highlands

The Highlands lie north and north-west of a line from Dumbarton to Aberdeen. From Aberdeen (pop. about 183,800, engaged in granite and trawling industries) to Wick is a narrow coastal fringe with a few minor fishing places. As for the rest of the area, it is of much the same consequence as the highlands of central Wales or Scandinavia ; the soil is poor and the communications are inadequate, so that there is no basis for a large and busy population.

Once, indeed, there were many more people ; but in the early years of the 19th century the peasants migrated to the already congested poorer quarters of Glasgow or crossed the sea to the American land of promise, and the Highlands were left to the forester, the fisherman, and the game-keeper. An attempt has been made to turn back the tide of depopulation and economic decline.

Road improvement schemes have been carried out ; the water power of the North-West Highlands and the Grampians is being used in the production of electricity ; and on the flanks of Ben Nevis, at Fort William, a big aluminium works has been established. Further electrification schemes are in progress, and it is intended that Highland villages and towns are to share in the benefits of cheap light, heat, and power. Given such improvements, the Highlands might develop into a great national park, a tourists' resort as popular and as health-giving as Switzerland.

The Central Lowlands

Between the mountains of the Highlands and the rolling hill-country of the south lies the region which, economically speaking, is the most important part of Scotland. In its cities and towns and rural villages is about 75 per cent. of the whole Scottish population.

So far as agriculture is concerned, the western counties are pastoral, cattle-raising and dairying being characteristic , those in the east permit of more general cultivation. Sheep-farming, too, is important. In areas where soil and climate combined make intensive cultivation worth while—in Strathmore, in the Carse o' Gowrie, near Dunbar, and in the Ayrshire coastal plain—the growing of the hardier cereals and potatoes, coupled with market gardens, the production of vegetable seeds, and dairying, give an added interest to rural life. But the main activities centre on the manufacturing industries of the coalfields

The Scottish coalfields are almost all in the Central Lowlands, the most important being the Ayrshire, the Lanarkshire, and the Fifeshire and Lothian. Cheap and plentiful coal, supplies of iron ore in the immediate neighbourhood, and the accessibility afforded by the Firths of Clyde and Forth, were foundations on which the industrial supremacy of the Lowlands was based

For long the Carron ironworks at Falkirk, established in 1760, were the most important in Europe ; but when iron-smelting by coal came into vogue the industry expanded westwards into Lanarkshire and Ayrshire. When the native resources of iron ore were exhausted the accessibility already mentioned facilitated the import of ore from overseas. There is an oil-shale industry, dating from the 1850s, in West Lothian and Midlothian.

The Clyde estuary has long been famous for its ships, and its shipbuilding activities attained such proportions as to outgrow local supplies of raw materials, with the result that semi-manufactured necessities had to be bought in England. The cotton thread of Paisley (pop. 94,500) developed world-wide importance.

On the east, linen and sailcloth and its derivatives, oilcloth and linoleum, occupy many people in Dunfermline, Kirkcaldy, and Dundee (Scotland's fourth city in population : about 178,000 in 1952) Dundee jute is world-famous. Dundee also makes jam from fruit grown in the Carse o' Gowrie and Strathmore. Edinburgh (pop. in 1952 some 475,000), the political capital, has absorbed its port, Leith; it has now its own "Whitehall" in the shape of government offices to deal with Scottish affairs. On the west, Greenock (77,000) is a minor Bristol with similar interests added to its coal.

Glasgow is the commercial and industrial metropolis of Scotland, and much more beside. Its population of 1,089,500 gives it a place second only to London and Birmingham in the list of Britain's cities. Coal and iron in the adjoining counties and sites on the Clyde most conveniently placed formed the foundations of a great shipbuilding industry: the Clyde for long ranked as the world's greatest shipbuilding area, and Clyde-built ships are on every sea.

But it was in textiles that Glasgow's predominance was first shown, and still to-day various branches of the woollen industry are in the city. Chemicals, clothing, engineering, and the manufacture of machinery are other of Glasgow's principal occupations.

Southern Uplands

The southern uplands lie between a slightly-curved line from Ayr to Dunbar and the English boundary. For the most part the hills are covered with grass to their summits, and some 80 per cent of the land is pasture or permanent grass on which feed flocks of sheep. This is indeed one of the principal sheep-raising districts of the British Isles.

In the west abundant rain makes for richer pasture, more suitable for cattle than for sheep. In this region, too, there is a centralised woollen industry based on readily accessible supplies of wool and abundant water for power and cleansing purposes. The tweeds of Hawick, Galashiels, Jedburgh, and Selkirk are renowned.

LESSON 6

Ireland, North and South

Britain's sister isle is divided politically into Eire (The Republic of Ireland), the former Irish Free State (26,600 sq. miles, pop. 2,958,880), and Northern Ireland (5,200 sq. miles, pop. 1,370,700). The division is resented by the Southern Irish and indeed by many in the north-east, but it roughly represents a cleavage of peoples and religion as well as of history, politics, and economics.

Northern Ireland comprises the six parliamentary counties of Antrim, Armagh, Down, Fermanagh, Londonderry, and Tyrone, and the two parliamentary boroughs of Belfast and Londonderry (The old province of Ulster contained in addition to these the counties of Donegal, Cavan, and Monaghan.) On the whole this is the busiest district in the whole of Ireland It is here, particularly in the Belfast area, that the industrial life of the country is largely concentrated.

The largest industry (apart from agriculture) is the manufacture of linen, based originally on home-grown flax but more recently on flax imported from abroad. The moist climate, suitable water, and abundance of labour tended to concentrate it in and near Belfast.

Some 56,000 of Belfast's 444,200 are employed in the linen industry, and in 1951 linen to the value of some £54,000,000 was produced. Shirtmaking is a closely allied industry having its centre in Londonderry (pop. 50,900).

The shipbuilding and engineering industry is next in importance to linen, employing normally 43,000 men—rather an exotic one, since it depends on imported raw materials, timber, coal and iron, and semi-raw materials. Some of the largest ships in the world have come off Belfast's stocks In Tyrone there are small coal deposits, but lack of coal and water power hampers the development of electrification.

As regards agriculture, its most-developed branch is livestock; meat, eggs, and bacon are produced for the English market. For the most part the farms are small, under 50 acres apiece, and much of the husbandry is for subsistence Flax and oats are largely grown.

As Northern Ireland is still part of the United Kingdom there is no tariff boundary between it and Britain; but a customs wall separates it from the Irish Republic.

Electrification

Ireland, exclusive of the six counties whose political allegiance and economic interests centre upon Belfast and the British connexion, consists of the central plain and a southern more or less mountainous region The former has a soil that is often fertile enough, but the drainage is bad because the plain is rimmed by the highlands, and bogs are many and extensive.

In the west in particular the pasture is excellent owing to the plentiful rains, and large numbers of cattle are raised, principally for the English market. Pigs are proverbially numerous, again with the same market in mind. Cereals are being increasingly grown. The

principal products are consumption commodities, bacon and beef, bread and butter, and sugar from local beet.

About 480 out of every 1,000 persons engaged in industry work on the land; next in order come textile workers, builders, and domestic workers There are a number of small-scale industrial enterprises, e.g. footwear, confectionery, jam-making, millinery, pottery, aluminium goods, etc

Under the direction of the state-owned Electricity Supply Board the country is being rapidly electrified. Wind power is used for charging batteries in small domestic plants, but at the other end of the scale is the great Shannon electrification scheme, carried out some years ago. Other electrical development schemes are in active preparation ; but they are hampered by the almost entire absence of coal (a little is found in Kilkenny, N. Kerry, and Clare). Peat is not a very satisfactory substitute. In the southern region the most productive area is the Golden Valley, crossed by the upper waters of the Suir, with Tipperary as its centre and Limerick as its port, where the soil is of great fertility. Dairying is a feature of the mild and moist south-west, on the abundant grasslands of Limerick, Kerry, and Cork.

Cork (pop. 75,000) is the chief town of the region, and from Cobh (formerly Queenstown) Irish bacon and butter are exported to England. Limerick (pop. 51,000) and Waterford (pop. 29,000) rank next in size.

Dublin, the capital of the Irish Republic, has a population of rather more than half-a-million. To a very large extent it owes its importance to its nearness to Holyhead (61 miles) and Liverpool (121 miles); it has also a number of industries, e.g. brewing, whiskey distilling, textiles, and biscuit making.

LESSON 7

France, Belgium, and Holland

In shape France is roughly a quadrangle. Imagine looking at Europe along the line of the English Channel beyond the Strait of Dover to the North Sea in the distance, a view roughly towards the north-east. On the left, the English side, the land slopes slowly up from Dover across the gentle rise of the Midlands and the scarps of the limestone ridges to the edge of the Pennine and Welsh heights—a total rise of less than three-quarters of a mile.

On the right the land slopes slowly upwards from Dieppe for less than 200 miles over similar limestone scarps to the region of the Côte d'Or and the plateau of Langres, near Dijon, where the heights and the character of the rocks resemble those of the Pennines and Wales.

This diversified trough between the Pennine crest and the crest of Central France is the western end of the great plain of Europe and it is roughly bisected by the English Channel. On the French slope is the basin of Paris.

The crest line of Central France begins in the south near the Gate of Carcassonne, winds north across the Auvergne mountains, where the heights just exceed a mile, and passes by the Vosges to the Ardennes. North of it lies the broad trough which slopes roughly north-west to the shallows of the Bay of Biscay and continues as the Paris basin into the Low Countries Across this lowland, diversified by the minor elevations of Normandy and Brittany, flow the Garonne, the Loire, and the Seine—broad-valleyed streams with numerous tributaries

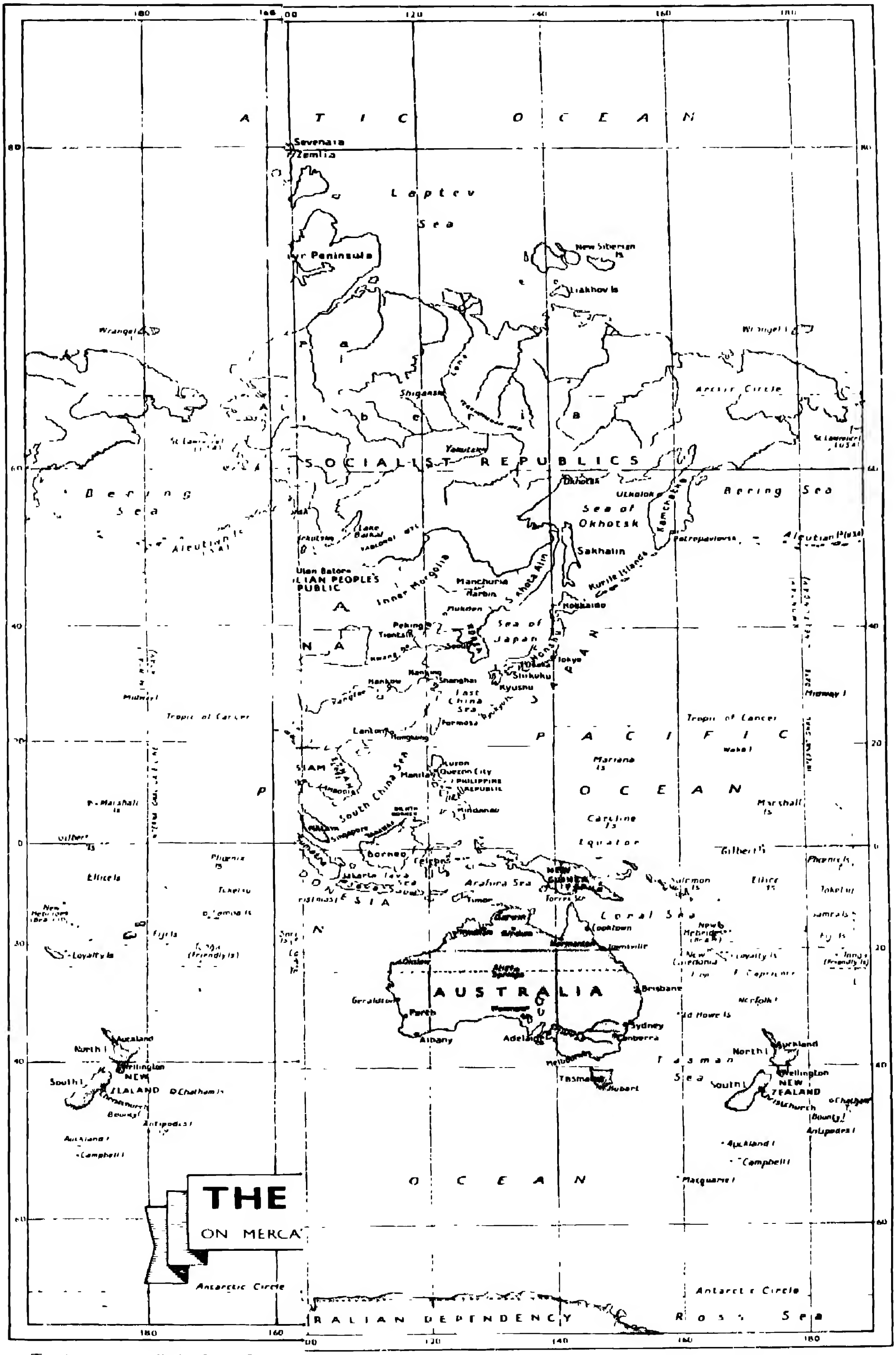
Try to visualise now this lowland plain from the Pyrenees to the frontier of Belgium. North of the Pyrenees, a bastion which does not invite man to make roads or railways across its precipitous slopes, is the Garonne valley, a land of mixed arable and forest centring on Bordeaux (pop. 254,000). Here are fields of wheat ; scattered sheep and cattle are more numerous on the higher ground near the Adour and the Tarn. A second centre is Toulouse (264,000). The speciality of the area is the wine industry of the Bordeaux district

Lush Valleys

The Biscayan coast is regular and flat, backed by the sand dunes of the Landes, inhospitable but broken by the long narrow estuary of the Gironde, with Bordeaux, the fourth port of France, at its head. The Landes end south-west at the Pyrenees, where Bayonne and Biarritz are almost on the Spanish frontier.

On the far side of the valley the Auvergne plateau stretches to the Gate of Poitiers, where are pasture lands with sheep and cattle. Farther north-east is the Loire valley, with Nantes (200,000) at the head of the narrow estuary. Bordeaux has its outports, Pauillac and Blaye. (Verdon, an up-to-date marine station where big liners could embark or disembark passengers and baggage without the delay of going to Bordeaux, was put out of action during the Second World War.) Nantes has an outport at St. Nazaire.

On the river are Tours and Orleans. In the Loire valley wheat begins to be more profitable, oats occur more frequently, and potatoes are grown on the higher ground. Cattle are numerous on the lowland. The grape vine tends to give place to the cider apple.



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North-west is the peninsula of Brittany, a rough counterpart of Cornwall, with its moorland interior, its fishing villages, and seaside *plages* dotting the coast from La Baule, near the Loire, right round to St. Malo. Across the neck of the peninsula one finds, as in Devonshire, cattle and cider apples.

Beyond the Normandy hills and through the Gate of Orleans is the valley of the Seine ; here are still cattle and cider apples, on the west of the river, with better crops of wheat between Orleans and Paris. Cherbourg is the Fishguard of Normandy, as Brest is the Plymouth of Brittany. Deauville and Trouville are seaside resorts with splendid sands.

Havre (107,000) is the chief importing port of France. Rouen (108,000), some distance up the river beyond its large sinuous curves, contributes in the importing but exports little. Built round an island in the river, inland beyond the reach of ocean-going ships, is Paris (2,725,000 in 1947), towards which concentrate increasingly the traffic and the interests of the land already considered. Paris lacks the marine trade of London.

It occupies the heart of a basin which is a transition zone between the agricultural south-west and the north-east of the plain which is the beginning of that great tract of densely peopled country between the Somme and Czechoslovakia Like London, it is tending to epitomise the industry of the country, yet its surroundings are agricultural ; wheat, oats, potatoes all yield well, and cattle and sheep are reared

Industrial Areas

Lille (189,000) and Roubaix (101,000) are the centres of a textile industry based upon the neighbouring coalfield, which extends across the nearby frontier into Belgium. Dunkirk, the only French port on the North Sea, like Havre usually imports more than is exported and rivals Bordeaux in total trade.

Along the coast are Calais and Boulogne. Valenciennes and Cambrai, which have perpetuated their names in textile specialities, are smaller places. Farther inland is Reims, centre of a wine district.

South-east from Paris the higher ground, near the crest, the western side of the Vosges, is more productive and more populous ; Nancy (113,000) is the chief centre, Metz is smaller. Both are interested in the coal and iron of the locality, and north-east lies an extension of the Saar coalfield into Lorraine which has some importance.

Here our survey of the west of the crest line is completed ; the area reveals itself as predominantly a farming country except along its north-eastern edge, where are situated 11 of the 18 French towns exceeding 100,000 in population. Roughly the area amounts to three-fourths of France, and its interests are mainly directed towards Paris and beyond the capital to the North Sea and the Atlantic Ocean.

As in England, the coal and iron fields are related to the high ground , farther south near the crest line are Le Creusot with its associated iron and steel works and St. Etienne (178,000) with its steel products.

One might survey the narrow eastern side of the crest from the north southwards The area comprises the slopes to the middle Rhine, the Saône, and the Rhône, and beyond the Saône to the Jura Mountains and beyond the Rhône to the Alps The northern section of the three -- the west side of the middle Rhine centres on Strasbourg (176,000) where, in the old Alsace and the modern Rhine provinces, farming of a general character supports a relatively dense population.

Passing through the Gate of Belfort one comes to the second area, the trough of the Saône valley. Here Dijon, the railway junction, is typical of the region as a passage-way, for agriculture does not yield productively, and the area is a transition district between Atlantic and Mediterranean types of cultivation

The French Riviera

At Lyons (461,000) one reaches the Rhône, and enters the third section, terminating at Marseilles (second city in France, with a pop. of 636,000), the chief port for French exports and

FRANCE. Showing frontiers, main rivers, and large towns.

one of the largest ports of the Mediterranean. Lyons is the centre for silks, Marseilles for oil refining, soap making, and kindred industries. Here the grape vine and the olive take the place of cereals, and sheep are more frequent than cattle, for grass is scarce where rain comes chiefly in winter.

Marseilles lies to the east of the Rhône delta, and along the coast lie Toulon (126,000), the naval base, Cannes, and Nice (211,000), centres of the French Riviera. Beyond Mentone is the little principality of Monaco, with the world-famous casino at Monte Carlo. All these three areas show the typical concentration of population in fertile valley floors; and this, added to the nearness of the Mediterranean, tends to isolation.

Farming Population

The French people number 41 millions, of whom about half are engaged in productive occupations, roughly in the proportion of two males to one female. About half the working males are labourers, three-quarters of them in industrial occupations; nearly a fifth of the working males are heads of farming businesses. More than half the employed females are labourers, half of them industrial operatives; there are as many female as male heads of farming concerns.

The fact that approximately one in five of the working population is the owner of a farm and that these are almost equally men and women, is indicative of the French desire for a patch of soil to cultivate, a desire which is maintained by the sub-division of properties at the death of the former owner.

All this, coupled with the scattered distribution of the people over the countryside, with the general agricultural nature of the occupations and produce, the comparative absence of definite concentrations of farming or other occupations, is evidence of the French devotion to the care of the "sou," to the worship of the minute values and the small bulk of commodities—a devotion which never grudges time and labour so long as the worker is his own master.

On the one hand there is thrift and economy, the typical peasant virtues, on the other the practice of supplying articles of luxury, like scents, champagnes, clothes, and jewels, for the world to buy—the practice which converted Paris into a kind of gigantic shop-window in which luxury goods and the life of extravagant luxury are alike displayed.

The Low Countries

Belgium and Holland (or the Netherlands, as Holland is officially styled) are the gift of the Rhine to Western Europe. On a map of Europe join Emden, just beyond the Dutch boundary in Germany, to Hull, continue the Belgo-French boundary through London to Shrewsbury, on the edge of the Welsh uplands, join Hull to Shrewsbury and Emden to Metz, in France; then separate this area into eastern and western portions by a line north-east from Calais. The eastern section is the Low Countries, the western is the major portion of lowland England.

The two areas have many similarities, although the western features are generally on a smaller scale than the eastern. The coasts at first diverge slightly, and later from bulges in Norfolk and at the Frisian Islands rapidly recede; along the one is the Thames estuary, then the Wash, with its Fen background, and then the Humber; along the other there is first the great estuary into which drain the Rhine, the Meuse, and the Scheldt, then the Zuider Zee—Yssel Lake (or Ijsselmeer) with its fens—and the mouth of the Ems. Inland, the low country rises slowly and gently towards Wales on the one hand and towards the heights of the Ardennes on the other; in the west the Pennines are missed and in the east the heights of central Germany.

Climatically the areas are somewhat similar, winter temperatures being a little colder and summer temperatures a little hotter in the east; the rainfall, too, is similar, the winter dryness of Lincolnshire being paralleled by the winter dryness of north-east Holland. Even the coal deposits are similar; in the west they lie near the Hull-Shrewsbury line, in the east along the valley of the Middle Meuse.

The parallel holds with reference to the people, for both are Germanic; and English, Dutch, and Flemish (which is the customary tongue of more than half the Belgians) are related linguistically. In each area live about 20 million folk.

Despite the similarities there are important differences. The continental coast itself is the western portion of the great stretch of sand-dune coast which marks the meeting of the North Sea and the North European Plain; the coastlands tend to be valueless.

The population is distributed differently: both fen areas tend to be sparsely peopled, but whereas the remainder of the eastern district contains an evenly distributed population which makes it one of the most populous areas in the world, it has no such great concentration of folk as is in the western area, in Greater London.

The rivers differ. Those on the Continent are the lower courses of waters which come from beyond the area and are larger, wider, deeper, and can be used for navigation; they not only run together but can be easily linked. The British rivers, on the other hand, are small, not navigated, and flow in troughs (the clay vales between scarps) which keep them apart.

If it is assumed that the metallurgy of the English Midlands is paralleled by that of the

THE LOW COUNTRIES. Sketch map of Belgium and Holland.

Middle Meuse, the textiles of the Ghent district are without parallel in the English area; the farming of the Trent Lowlands counts for little in comparison with the agriculture in the east.

The net result of the fact that the eastern area comprises two political units with their attendant separatism, whereas the western area has been, except for the Metropolis, only an appanage of industrial and factory England for upwards of a century, is that in the east, land is valued much more highly than in the western area. Tiny plots command a high price and are therefore thoroughly tilled, so that spade cultivation and the exploitation of human effort on relatively poor land compel the whole area to be a land of small holdings.

Belgium

Starting from the French boundary, let us traverse Belgium (11,775 sq. miles; pop. in 1951 estimated at some 8,703,000). On the east, towards Luxemburg and Germany, is the higher ground. Before us is the plain across which flow parallel with the coast the Scheldt and the Middle Meuse with many of their tributaries. The coast, like its English counterpart, lacks seaports but has packet stations at Ostend and Zeebrugge. At the Scheldt end stands Antwerp (pop. 477,490), one of the chief seaports of western Europe.

Nearer France, on the Scheldt, is Ghent (218,000), sometimes called the Manchester of Belgium, with its attendant smaller places, Courtrai, Tournai, and Mons. Ghent is a centre for the celebrated linens of the Lys valley. Brussels (pop. 927,800) is the central point of the Belgian plain and the nodal point for the railways.

Along the Middle Meuse are Namur and Liége (250,600), the centre for coal, iron, and zinc. Between Liége and Antwerp is the Campine, a waterlogged, infertile area with a scanty population, where there is a coalfield centring on Genck, and across which is the Albert Canal, linking Scheldt and Meuse.

The Netherlands

Farther north-east lies Holland (12,712 sq miles; pop in 1953 was some 10,400,000), with its dune coast, backed by extensive areas below sea-level. Here the handicap of the water is overcome at vast expense in human effort, for the land has to be spade-tilled; here are the distributaries of the Rhine delta. Rotterdam (697,200), the big Rhine port, and Amsterdam (855,000), the capital city, summarise the antipathies of Holland.

Both are seaports, but Amsterdam stands for the provincialism of Holland, while Rotterdam, on the Rhine gateway, represents the circumstance that the country is but a passage-way from the Rhine valley to the sea.

Rotterdam in normal times does twice as much trade overseas as Amsterdam and, in addition, does nearly twice as much trade as these two amounts together in Rhine-borne transit trade. Commerce and transport activities occupy more people relatively in Holland and in Rotterdam than in most similar areas elsewhere in the world.

Amsterdam gained somewhat in the past from the trade of the country with the former Dutch colonies in the East Indies, notably Java; this trade, chiefly in tin, tea, coffee, tobacco, and rubber, was a relic of the great days of the Dutch mercantile marine. All that now remains of the once extensive Dutch territories in the East Indies is the western half of the island of New Guinea.

The Hague, the seat of government, on the coast (584,500), Utrecht (196,700), Haarlem, a bulb centre, and Groningen, the chief town of the relatively poor north-east, are the other most populous towns. There is some coal near the Meuse in Limburg, but it is insufficient for the localisation of great factory industries; and there are chemical works largely connected with soap production based upon imported tropical vegetable oils.

Of the three chief cereals, in Belgium oats and wheat come first and second; in Holland the order is rye, oats, and wheat. In addition, in both, sugar beet and potatoes are important crops. In Belgium horses, and in Holland cattle for the dairying industry, are the chief farm animals.

In Belgium one in six and in Holland one in every four males works on the land most of them their own land Holland has had relatively little trade except the river trade from Rotterdam, the limited colonial trade mainly from Amsterdam, and the exchange trade with Belgium.

The latter by contrast has traded on a larger scale with France, Britain, Germany, and the U.S.A. All of these are industrial and commercial competitors with Belgium, but the small state maintains its position by reason of its relatively cheap labour supply. Both Holland and Belgium have extensive railway and canal communications, the North Sea ship canal to Amsterdam being notable.

LESSON 8

Germany, the "Old Reich"

THE Old Reich, or German Realm, includes two distinct areas: the uplands and mountains, and the plain. The dividing line runs roughly east and west, from the point where Belgium, Holland, and Germany meet, through the Essen district and Leipzig, to near the old boundary with Czechoslovakia. Each area has two natural divisions.

In the southern highland area the Rhine valley is exceptional and is distinct from the remainder In the northern lowlands it is the coastal section which differs. This land of marsh, heath, and moor, with large stretches of sandy soil, continues east from Holland across the width of the lowland to Hanover, where it is wide inland from the North Sea, narrower near the Baltic Sea, though less narrow in Mecklenburg and in the district formerly called East Prussia This is the dune country, the gift of the rivers which deposit here the débris from the European mountains

Across the plain flow the Rhine in part, the lower Weser, most of the Elbe, and most of the Oder. Among the mountains are the right-bank Rhine tributaries the Main and the Neckar, and the upper Danube. The southern area extends from the Harz and the heights of Thuringia to the Alpine foreland. In the west the Black Forest overlooks the rift valley of the Rhine, with France across the river. In the north-west is the Rhine gorge. In the east is the edge of the Bohemian plateau.

Industrial Germany

The topography of the plain has been profoundly affected by the fact that it was the southern section of the land which was once covered by the great ice sheet, with the result that much of it comprises fine glacial débris, which has been sifted and sorted and transported, here into hillocks and dunes, there into water-spread plains with a tendency to the formation of meres and marshes—all subject to change and the transience of windswept, water-charged land. West of the Elbe, in the Magdeburg district, is an extensive patch of brown and black steppe soils; elsewhere the southern plain is sandy

Where the plain meets the upland lie the coalfields—in the west near Essen; in the east near Breslau. This area is industrial Germany and is, with the Meuse area, the major portion of the belt of dense population, which stretches in a diminishing wedge shape from the Rhine deltaic lands almost due east across Europe; here is the notable concentration of European folk.

It is a mark of the peculiarity of the gorge and rift sections of the Rhine valley that an extension of this wedged crowd of people occupies the flats of the valley floor. Throughout Germany the belt of dense population lies farther and farther from the sea as it extends eastward.

Arable Farming

Where there are many people the arable ground is held in smaller holdings which are more valuable, and this section of the country is an extension of the French and Belgian farmland type. Added to the fact that many people mean large markets is the circumstance that the northern and southern fringes of the country, the most maritime and mountainous areas, are also the coolest and most humid; the peopled area is drier and warmer.

The cool and humid area is the pasture land, where the people are engaged in the production of cattle, milk, hay, and forage crops. The warm and dry middle belt is the most arable, and is mainly suited to the cultivation of rye, potatoes, and oats; these give place to wheat, barley, and sugar beet where the best steppe soils and the warmest temperatures during the summer growing period occur in Germany.

Middle Germany thus has the most people, the main industrial areas and the most suitable conditions for arable farming.

With a total population half as big again as that of France, undivided Germany has more

GERMANY. **From 1949 this country was divided into West Germany and East Germany; both became independent sovereign states in 1955. Inset, map of the important Ruhr area; this covers about 1,800 square miles.**

than three times as many urban centres each with a population in excess of 100,000. Berlin (total of Eastern and Western Berlin approximately 3,400,000), between the Elbe and the Oder, on the Prussian side of the best land, between the Bohemian edge and the Baltic Sea, is a convenient nucleus from which the plain can be controlled and reached.

It is a traffic centre for the waterways which are the product of the present drainage of the ice-sheet debris, and for the easy-gradient railways with a downhill passage from the important industrial and farming areas and, in addition, a comparatively level journey to the coast. Its ports are Hamburg (pop. 1,604,600), for long the greatest port of Continental Europe, at the Elbe mouth for the North Sea and the Atlantic, and Stettin (now included in Poland as Szczecin) (178,000) at the Oder mouth for the Baltic Sea. To the north-east is the combined port Gdansk (Danzig)-Gdynia, in Poland, with a population of 196,600. To the west lies Rotterdam, which, though actually in Holland, was long dominantly German in matters of trade.

Then there are Bremen (444,200) at the mouth of the Weser, and Kiel (253,800), on the neck of the Jutland peninsula at the Baltic end of the ship canal connecting within Germany the North and Baltic Seas. Königsberg in East Prussia was incorporated in the U.S.S.R. in 1945 and re-named Kaliningrad.

The Ruhr

With the exception of the capital, the real plain lacks cities; the southern industrial margin, on the contrary, contains most of the cities. In the east is Breslau (289,700) in Silesia, (now Polish territory and called Wroclaw), the heart of the upper Oder trough; next, in the middle of the Elbe valley, in Saxony, are Dresden, Leipzig, and Chemnitz, where industry is helped by local coal supplies; next come Magdeburg, Brunswick, and Hanover. In the west is Westphalia, with a great coalfield. East of the Rhine are Münster, Essen, Dortmund, Düsseldorf, Duisburg, and Wuppertal.

The area between Duisburg (408,900) and Dusseldorf (498,400) on the Rhine and Dortmund (500,000) some 40 miles or so to the east—the area including Essen (605,000), Bochum, Gelsenkirchen, Oberhausen, Mulheim, Wuppertal (Barmen-Elberfeld), and the rest is known as the Ruhr.

Nearly 70 per cent of Germany's coal deposits are estimated to lie in the area, and to this prime essential of modern industry is added the second—transport. The closest network of railways, rivers, and canals in Europe is there, and Duisburg is the Continent's largest inland harbour.

The third essential—iron ore—has to be brought from a distance, from Lorraine, in France, and farther afield at the present time. Since the iron of Lorraine was well nigh useless without the coke of the Ruhr, the two areas were linked by rail and canal, and a close working arrangement was entered into by the German coal-owners and the French ironmasters. But the political frontier in between proved an obstacle to economic development, and the French occupation of the Ruhr in 1923 and the German invasion of France in 1940 might be thought of as efforts to wipe out this political barrier to economic development.

West of the Rhine are Krefeld (pop. 170,500) and Aachen (Aix-la-Chapelle, pop. 130,000), and

up the Rhine, Cologne (German, Koln ; pop. 590,800), the second city in Prussia, and the great centre of the west. Above Cologne is the Rhine gorge. Like the Saône valley, it is a passage-way, with small nuclei at Bonn, Coblenz, and Bingen ; farther up is the rift valley of the middle Rhine, with Wiesbaden just back from the stream near Mainz at the Main confluence, and Mannheim (244,000) at the Neckar junction with the Rhine.

In the upland area Frankfurt-am-Main (524,000), Karlsruhe, and Stuttgart are related to the Rhine tributaries Main and Neckar ; Kassel and Erfurt are in the north, and Nuremberg on the Pegnitz and Munich (831,000) in the Alpine Foreland, both in Bavaria, belong to the valley of the Upper Danube, with an obvious detachment towards Austria and Vienna lower down this great river, which flows from the Black Forest.

Next to the area of steppe soil in the plain, Bavaria is the chief region for food grains, rye and wheat, both winter crops, also for potatoes, barley, and sugar beet Bavaria is the main hop area ; Munich beer is celebrated. The Rhine country, with the Moselle valley area, is the wine district.

With the exception of the Soviet Union and France and Italy in the case of wheat, undivided Germany's production of wheat, rye, barley, oats, potatoes, and sugar beet usually exceeds that of any other country in Europe Germany used to lead Europe in the production of rayon, beer, butter, iron, and steel, and has surpassed Britain in the mining of coal

In proportion to her population Germany has not been in the past nearly so interested in overseas trade as Britain or Denmark, despite her large total trade ; she endeavoured to be self-contained and specialised in the production of substitute (*ersatz*) materials.

Germany after the Second World War was confronted with many problems, perhaps the most serious being the partition of the country into East and West Germany, the economic differences to which this gave rise, and the artificial barriers set up between the two areas

Most of Germany, like Britain, was originally forest, and the forest industry of the upland area is still important, especially in the Black Forest range. West of the Elbe, near Magdeburg, is one of the world's chief deposits of potash, the Stassfurt district, and on this natural resource has been built a large chemical industry for drugs and fertilizers.

Consequently there is a large development in the manufacture of aniline or coal-tar dyes. Textile factories operate in connexion with both coalfields, but there is not the localisation of the different types of cloth-making which is so marked a feature of northern England.

Farther east, with a decidedly more continental climate marked by long spells of unvaried weather, and a greater difficulty of access to the ocean, Germany does not enjoy the same facilities as England.

The advance of Germany to the position of one of the Great Powers of the world was due to the policy of industrialisation that was adopted following the military triumph over France and the establishment of the Empire in 1871. In that year the country with its population of some 40 millions had reached the limit of density that she could support out of her then resources Large-scale emigration was not favoured, because Germany had no colonies of her own to which the emigrants might proceed

To import still more food was the alternative but what could be exported in exchange ? The answer to the problem lay in the coal, iron, timber, chemicals, and other economic goods which existed beneath or on the German soil. Government help was forthcoming in many directions The country's position in the very heart of Europe led to the development of a magnificent system of internal, cross-continental communications.

The utmost reliance was placed upon science ; German chemists in particular lent their powerful aid to the farmer and to the industrialist.

So it was that in 1914 Germany felt herself strong enough to make a bid for world power ; and although it ended in disaster in 1918 it was renewed 20 years later under Hitler at the cost of immensely greater disaster.

LESSON 9

The Scandinavian Lands

The European trough which is occupied by the North and Baltic Seas and by the North European Plain is responsible for the character of the three northern lands : Norway, Sweden, and Denmark.

The greater part of Scandinavia, i.e. the two areas of Norway and Sweden, forms the mountainous wall of the trough, with a gentle slope upwards from the Baltic Sea and a steep, broken face to the Atlantic Ocean, which here reaches oceanic depths almost immediately, for the peninsula has no Continental Shelf.

Out of the waters rises - as it were by accident --the peninsula of Jutland, which with the neighbouring islands across the entrance to the Baltic Sea forms Denmark. Southern Sweden is in the

main almost equally an accident, due to the level at which the waters in the trough stand.

The gap between northern Jutland and southern Norway, known as the Skagerrak, is not such an accident, for between them, below the water surface, lies a deep depression backed landwards by Norwegian mountains.

All Norway and most of northern Sweden make up an area which repeats northern Scotland on a larger scale, with greater heights, with a more indented Atlantic fjord coast, where the fjords are larger, and with an island fringe along the coast, the skärgard. The main axis is near the ocean, so that the Swedish slope is comparatively long.

Here the rivers flow almost straight to the Baltic Sea: along this side an almost definite break of height separates the higher snow-capped mountains from the Swedish slopes, which are extensively forested. Into the northern part of the Baltic, the Gulf of Bothnia, flow 50 or more rivers each capable of floating timber logs and slow enough to obviate jams—in all, some 15,000 miles of suitable waterway. Near the coast the logs, felled by the lumber-men in the forests, give rise to the industries of saw-milling, wood pulp, paper, and matches.

Southern Sweden, comprising Svealand and Gotaland, is separated from the northern uplands by the notable lake system, for almost half the land area between the Skagerrak and the Aaland Islands is occupied by the lakes Vanern, Vetter, and Malar, and the Stockholm estuary.

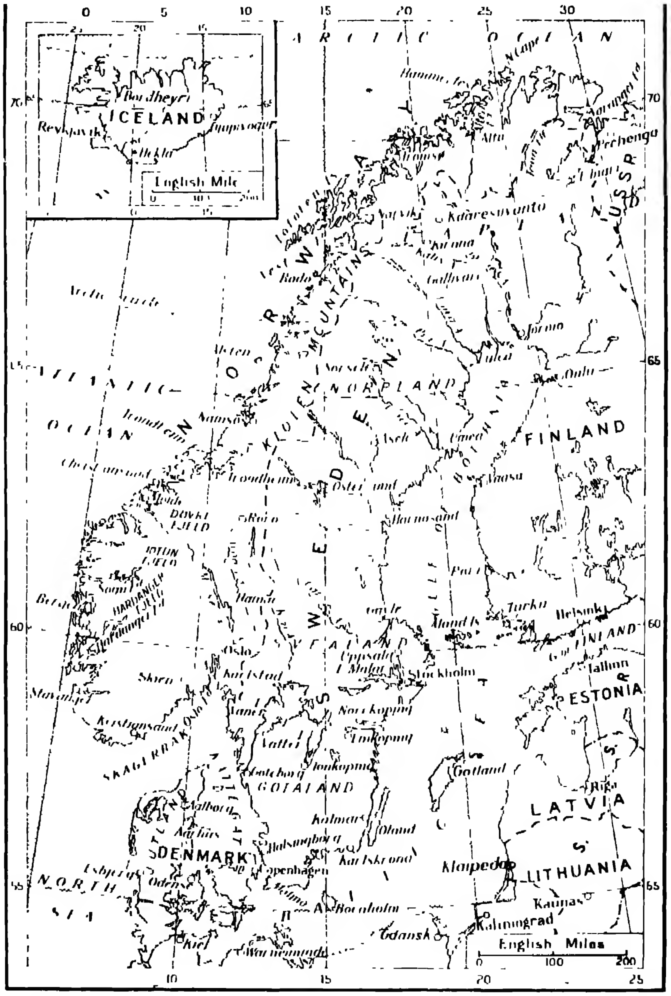
South of these lakes Gotaland is higher in the centre and reaches south-west to the Sound, a narrow strait across which lies Copenhagen, where Denmark begins. Denmark, whether peninsular or insular, has the character of the neighbouring continental plain.

The whole area has long summer days with from 18 to 24 hours of possible sunshine, shorter winter days of 6 hours at a maximum or none at all: the long Arctic day is balanced by the long Arctic night. The sun elevations are lower, with greater solar effects than in Britain.

There is much less rainfall, for even south-west Norway, though warmed by the winds from off the Atlantic waters, is not so rainy as western Scotland, while Northern Sweden approaches the dryness of the cold deserts. Many of the lakes remain frozen for half the year. The higher ground is moorland, much of it being a land of exhaustion.

Near the Norwegian coast, by the Lofoten Islands, is one of the world's chief fishing-grounds, noted for its cod. In the south of Norway the valley of the Glomma forms an important traffic way between the fjord at Oslo and that at Trondheim; west of this valley the heights are the fjelds of Hardanger, Jotun, and Dovre.

Even the lower lands repeat the conditions which prevail in northern Germany, where the



SCANDINAVIA. Norway, Sweden, Denmark, Finland, and (inset) Iceland. Norway and Sweden form the greater part. The Jutland peninsula and neighbouring islands form Denmark.

arable land yields rye, oats, and potatoes, and where pasture tends to be more important than arable production.

The whole area contains about 15 million folk, of whom about half are in Sweden and rather more than a quarter in Denmark, spread over the areas of lowland, of which Denmark (about twice the size of Wales) is roughly half. Copenhagen, the capital of Denmark, had a population of some 975,000 in 1950. In Sweden the capital, Stockholm, had 734,000 inhabitants in 1950 ; Goteborg some 350,000, and Malmö 189,500 In Norway, the capital, Oslo, had 429,000 in 1949, Bergen 110,000.

By comparison with Belgium the whole area yields similar quantities of oats, rye, and wheat ; also of sugar beet, but a rather larger tonnage of potatoes. Norway's crops are negligible except for potatoes. Denmark is famed for producing bacon, butter, and eggs. Sweden has many dairy farms, and in Norway dairying is an important industry.

Industries

Sweden and Norway produce a large proportion of the world's total paper and pulp, the manufacture being based on water power from the mountain rivers. Both areas are faced with the danger of scarcity of suitable timber, and the problems of forest conservation and afforestation occupy great attention in Scandinavia.

There is no coal, but Sweden has two notable iron-fields : the northern field, in Lapland, Gallivare and Kiruna, has its ports at Lulea on the Baltic and Narvik in Norway ; the other is in the mountainous lake district to the west of Stockholm. Most of the ore is exported. Denmark is a great exporter of butter, bacon, and eggs. All three of the northern countries import coal and oil for power purposes.

Norway is a producer of a few primary products, and the development of her fisheries cod among the Lofotens, herring off Bergen, etc. gives a large return. Herrings are exported in large quantities to Germany, Sweden, and the Baltic lands beyond. Cod, salted and dried, goes to the Catholic countries of Europe. There is a substantial output of iron ore and pyrites.

Oslo is a port situated on the chief lowland stretch in the country. Compared with Stockholm, the Swedish capital, Oslo is cramped. Stockholm, the northern Venice, situated between a lake and an estuary, with the Baltic before her and considerable lowland to the south and south-west, with some minerals and many trees to the north, has a larger outlook. Neither compares favourably in situation with Copenhagen, the harbour of the area, where the Sound is a passage-way by sea and a convenient narrowing for the train ferries.

Two train ferries connect the east coast of Zealand with Sweden across the Sound, one from Copenhagen to Malmö (16 miles), the other from Helsingor (Elsinore) to Hälsingborg (3 miles). Before the Second World War there was a train ferry service between Falster and Warnemünde in East Germany, later replaced by a service between Falster and Grossenbrode, in West Germany.

Danish dairy farming is based upon a co-operative system, which makes the best use of the small holdings in which the land is held; a relative warmness in winter, which enables cattle to be kept in the open ; and the near-by markets, which almost make the Danish production one for local consumption only, if one ignores international boundaries. The predominance of butter—not cheese production gives other farmers an incentive to produce feeding-stuffs, affects the growing of cereals and roots, and creates a demand for fertilizers in exchange for the butter.

Iceland

Though situated far out in the Atlantic, Iceland must be considered with Denmark on account of its past history ; the two countries had a political link in that they shared, until Iceland was proclaimed a republic in 1944, a common sovereign, although in their institutions they were otherwise quite distinct.

The island of Iceland is the nearest land to Britain where underground heat comes to the surface in the form of geysers and volcanoes ; this is the more notable as the land is partly ice- and snow-covered. Less than one per cent. is under cultivation, and only hay, potatoes, and turnips are produced. Cod and herring fisheries are considerable.

Between Iceland and America the sea is difficult on account of floating ice; between the island and Europe the sea is kept open by the warmth of the oceanic waters, which here accumulate heat transported by wind and wave from the tropics.

This characteristic feature is associated with a relatively less dense atmosphere and with the cyclonic weather which keeps Britain covered through most of the winter with a layer of misty air, too warm for frost and snow. In relation to the shortest (great-circle) air route from Europe to America, Reykjavík, the capital, has acquired importance. Its population in 1951 was 57,500.

Finland

The western half of the isthmus, by which the Scandinavian peninsula adjoins Europe and completes the Baltic lands on the north-east, comprises Finland. Though a lowland, it is not part of the plain, for it is the continuation, east of the Gulf of Bothnia, of the Swedish slopes down which the parallel streams run into the Swedish lakeland.

Finland is a dome of ancient rock, well smoothed, whereon rubbish-heaps of old glacial Ice Age débris, sorted out haphazard into ridges and troughs by floods from the melting ice, have tended to fix a surface drainage, marked to-day by lakes and streams in thousands, all either interconnected or lightly held apart by ridges of morainic rubbish.

Here are the Finns, neither Slav nor Teuton, in a forest land similar to that of northern Sweden, more extensive in the south than in Norway, thinning out to the north, where Finland crosses the Lapland ridge and then slopes down to the Arctic basin at the Varanger Fjord.

All Finland is north of 60° N., and therefore has the latitude of southern Greenland and Iceland. In summer it has English warmth, coupled with longer hours of sunshine from a less elevated sun. In mid-winter there are from 10 to 20 degrees of frost persistently.

Helsinki is the capital and largest town, with a population in 1950 of 399,000. Other important towns are Turku with 107,000 inhabitants and Tampere with 105,000.

The Petsamo ice-free port on the Arctic, with a substantial area running to the border of Norway, was ceded to Russia in 1944. In the south the Karelian isthmus and Viipuri became Russian with the Finnish withdrawal to the 1940 borders. The Porkalla-Udd peninsula south-west of Helsinki, leased to the U.S.S.R. as a military base, was returned to Finland in 1956.

Its remarkable system of lakes and canals gives Finland excellent internal communications. Forests cover more than half the local area, and much of the rest is infertile. Agriculture, stock-raising, and dairy farming, lumbering, and fishing are important occupations, and timber, wood pulp, and dairy produce are exported. Industrial expansion, especially in the field of shipbuilding and heavy engineering and metal industries, due to war-reparation claims by Russia, resulted in an increase in the number of industrial workers in Finland to 10 per cent. of the total population.

LESSON 10

Poland and the Baltic Lands

POLAND is definitely a transition zone. Here is the meeting ground of Slav and Teuton, of the central mountain and the northern plain, the drainage to the north and that to the south-east. Here is the edge of the land once ice-covered, and the edge of the mineralised area which stretches eastward from north-east France and Belgium. The climate changes gradually from oceanic humidity and cloudiness to Continental dryness and sunshine, as the sea cyclones fail to penetrate farther east.

Poland was once mainly an agricultural land, despite the presence in the south-west of a large industrial region based on the Silesian coalfield. For the most part the land was held in small holdings, too small indeed to provide a really satisfactory livelihood. In 1931 three-fifths of the farms were of less than 12 acres each, and a great many had less than five acres apiece. In the Polish language there is a special word for the time just before the harvest, when the peasants had to tighten their belts and in bad seasons were on the verge of starvation. In many a year they would have starved indeed if it had not been for their potatoes.

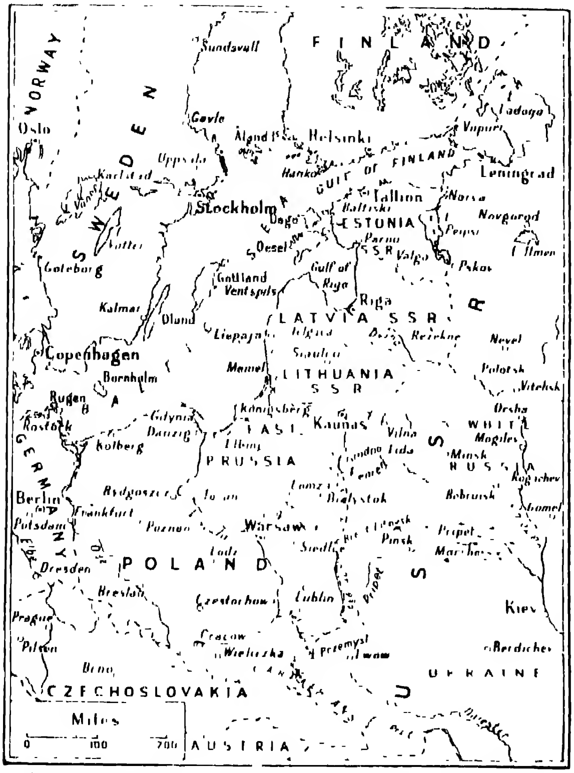
Redistribution

In the space of 20 years following the resurrection of an independent Poland in 1918 a vast scheme of land redistribution was put in hand, aimed at the breaking-up of the large, almost feudal, estates into small holdings of a size sufficient to maintain a peasant farmer and his family in moderate comfort. At the same time a number of the tiny holdings were consolidated into farms of a size that could be economically worked.

But in spite of redistribution the countryside seemed to be carrying a larger population than it could bear, and every year numbers of Poles emigrated and many thousands spent their summers working as casual labourers on the farms in Germany. With a population of some 35 millions, a birth rate of 25·5 per thousand—one of the highest in Europe—and a population density of 214 per square mile, Poland before 1939 was faced with problems of almost baffling difficulty.

Two-thirds of the Polish people are country-dwellers, but before the Second World War the industrial areas were making considerable headway. Petty trading, small shopkeeping, and the like was almost entirely in the hands of the large Jewish element—three millions out of the world's 16 million Jews were in Poland, but the Nazi policy of extermination by murder reduced the number of Jews to fewer than 100,000.

As a result of the 1939–1945 war Poland lost about 30,000 square miles of territory. Almost half of her pre-war territory went to Russia in the 1939 partition, this being partly compensated by new territories in 1945. The eastern frontier was, at the Potsdam Conference, 1945, based on the Curzon Line of 1919 with certain deviations to Poland's advantage, while the western frontier ran along the Oder



POLAND AND THE BALTIC STATES of Lithuania, Latvia, and Estonia, now states of the Soviet Union.

and Neisse taking in Breslau (now Wroclaw) to the Czechoslovak border. That gave a total area of 120,782 square miles and a population of 25 millions.

Poland was changed by the Second World War from a predominantly agricultural country to one in which agriculture and industry were of equal importance. The change-over was effected partly by nationalisation and state planning of industry, also by the acquisition of large industrial areas from Germany as a result of the westward shift of the German-Polish frontier.

Around Warsaw, the capital (population 600,000 in 1950), there is a considerable textile manufacture, based on relatively cheap labour to be drawn from the surrounding farms, and the capital has breweries and distilleries, flour-mills, saw-mills, furniture factories, and the like. Lodz (pop 592,000), Poland's Manchester, Bialystok, and Czestochowa are other textile centres ; Lodz is also a metallurgical centre, as too are Bydgoszcz and Poznan (291,000)

In the south-west is a great industrial area comprising the principal coalfields and iron and steel works of Silesia, incorporated in the new Poland in the peace settlement of 1919. There is another large coalfield at Cracow. In this Silesian area are iron, zinc, silver, lead, copper, and salt mines.

In the Carpathians the higher ground is covered with forests, though the lower slopes are cultivated. Stretching eastwards from Cracow is a belt of petroleum deposits, part of the Galician oilfields. There are salt mines at Wieliczka.

From 1919 to 1939 Danzig was a " Free City " under the protection of the League of Nations, but the Treaty of Versailles laid it down that with Poland it should form a single customs area. Following the German invasion in September 1939 an invasion one of whose ostensible objects was the return of Danzig to the Reich — the city and its adjacent territory became " the Hanseatic City of Danzig." It came under Polish administration again in 1945 pending a peace settlement.

Situated on the delta of the Vistula, it is a national centre for the export and import trade of Poland, but its largely German population and markedly German character caused the Poles to found an entirely new and completely Polish port Gdynia, lying on the Baltic coast to the west of Danzig in what was called the Polish Corridor (between the former boundaries of Germany and East Prussia).

Though it had no inland waterway, Gdynia was connected with industrial Poland by rail, and its trade soon rivalled Danzig's. Since the incorporation of Danzig into Poland as a result of the Second World War the two ports have been amalgamated and now function jointly as the country's principal port (pop. 196,600).

The Baltic States

The three countries Estonia (capital Tallinn on the Gulf of Finland), Latvia (capital Riga on the Gulf of Riga at the mouth of the Dvina), and Lithuania (capital Vilna ; from 1919 to 1939 the capital was Kaunas) are commonly called the Baltic States. All three formed part of European Russia before the Russian Revolution of 1917.

In 1918 they achieved their independence and made considerable progress, largely by the aid of British capital and with the British market as the principal recipient of their exports. In 1940 they were drawn into the Soviet Union as constituent republics, but were over-run in 1941 by German armies. Reoccupied by Russian forces in 1944, the republics once more became part of the Soviet Union.

Agriculture (rye, wheat, barley, oats, potatoes, flax) and dairyfarming are the basic occupations; small holdings are the general rule. Much of the area is under forest, and forestry and wood-

working give employment to many. Estonia has a small shale-oil production Latvia has developed her manufactures at Riga, Jelgava (Mitau), and Liepaja (Libau).

The Baltic States are important as containing some of the chief ports on the Baltic Riga, Tallinn, and Liepaja in particular—which give access to the Russian interior Tallinn (formerly Reval) is seldom closed by ice for more than a few days; Baltiski (Baltic Port), a little to the west, is almost always open; Ventspils (Windau) and Liepaja are ice-free; Riga is normally blocked for less than two months in the year.

LESSON 11

Russia in Europe

FROM the Arctic Ocean and the White Sea in the neighbourhood of the Arctic Circle, Soviet Russia extends southwards through 40 degrees of latitude, some 1,500 miles, to the Black Sea and the landlocked Caspian Sea.

Westwards it stretches some 1,200 miles or so, from the somewhat narrow ridge of the Ural Mts. on meridian 60 E., approximately to the water-parting beyond which lie the Baltic rivers near meridian 30° E

Across Russia, from the Valdai Hills to the neighbourhood of Kharkov, is a minor water parting separating the valleys of the Volga and Don from the Dnieper valley. East of these hills is the land of the Great Russians; west of them is the Ukraine, the land of the Little Russians, sometimes called Ruthenians.

To the north of the Ukraine is a small area, the land of the White Russians, abutting on Poland and Latvia. Eastwards lies the huge mass of the Asiatic territories of the U.S.S.R (Union of Soviet Socialist Republics), and westwards Russia has the narrow gate near Leningrad to the Baltic Sea.

Physical Features

The physical geography of this vast area is on the whole simple. A small portion along the northern coast is *tundra* infertile, barren, frozen desert. South of this for some 15 degrees of latitude, about 1,000 miles, is the wide strip of the natural *forest*, coniferous in the north deciduous in the south. This strip lies north of the latitude of London, and is entirely forest land or forest clearings, with less grassland and more woodland than the rest of the plain in Germany.

South of 51½ N to the Black Sea is the central grassland region, the *steppe*, which becomes a dry grassland region and semi-desert towards the Caspian Sea. South of this, in the south-east, is the Caucasus range, with its peculiar submontane region to the south

Throughout the grasslands the soil is either black earth or chestnut earth, specially suited to the production of the wheat-barley type of cereal, and relatively unsuited to other crops which flourish in a more humid climate with a different soil.

The whole of Russia has at best in winter a freezing-point temperature, which is warm in the south and west relative to the cold of the east and north The summer tends to be hot, sunny, and comparatively dry In winter much the greater part of the land is snow-bound, and rivers and lakes are frozen.

The densest population occurs in the best part of the black-earth region south of 50° N; the population thins out both to the north and the south to 60° N and to the Black Sea. North of 60° N. and south-east of a line through Rostov, Saratov, and Kuibishev there are few populous centres.

A Federation of Republics

Russia, or more correctly the Soviet Union, is a federation of republics, more or less self-governing By far the largest in size, population, and wealth is the R.S.F.S.R (Russian Soviet Federal Socialist Republic), whose capital is Moscow (also the capital of the U.S.S.R. as a whole). It stretches from the Baltic to the Pacific, from the north-east of Europe to the Far East opposite the islands which link Asia with North America.

There are also in Europe and Asia Minor the Ukrainian (capital Kiev), White Russian (Minsk), Azerbaijan (Baku), Georgian (Tbilisi), and Armenian (Erivan) S.S.Rs In 1940 the three Baltic States of Estonia, Latvia, and Lithuania became S.S.Rs., and at the same time Bessarabia (recovered from Rumania) was incorporated with certain Soviet territories to form the Moldavian S.S.R. Ruthenia, ceded by Czechoslovakia, became in 1945 an autonomous government included in the Ukrainian Soviet Republic. A Karelo-Finnish S.S.R established after the Russo-Finnish war of 1939 40 was absorbed in the R.S.F.S.R in 1956.

Each constituent republic enjoys a certain degree of autonomy, its system of government being modelled on that of the parent body, the U.S.S.R. Any matters affecting the Union as a whole are, however, dealt with from the centre at Moscow. (Russia in Asia is dealt with in a later Lesson) All in all, the Soviet Union covers over a sixth of the land surface of the

globe, inhabited by nearly a tenth of the whole human race.

Before the First World War Russia was predominantly agricultural, the land being owned by big landlords and worked by a peasantry not far removed above serfdom. One of the earliest decrees of the Bolsheviks following their successful revolution in 1917 was the nationalisation of the land, and this in practice meant the occupation of the big estates by the peasants who divided them up among themselves as small holdings.

The primitive methods of the peasant husbandmen were unable to produce sufficient foodstuffs for the growing towns; and under successive Five Year Plans, the first of which began to operate in 1928, the small holdings were consolidated into larger units, the so-called "collectives" or *kolkhozi*.

The individual peasant still has his own hut and vegetable plot, his poultry, and perhaps a pig and a cow; but he is bound to spend most of his time working in the fields of the collective farm, using methods and machinery far in advance of those to which he and his fathers had been accustomed.

The crops are grown almost entirely for home consumption. Trade in the Soviet Union is managed by officials in the interest of the State, and the produce of the collectives is purchased at fixed prices and retailed through co-operative organizations to the townsfolk. The peasants are permitted to carry on small-scale trading in poultry, eggs, etc., produced by their own efforts—not by hired labour.

The chief wheatlands are in the black-earth region of the Ukraine. In the colder regions to the north, flax and sugar beet flourish. Rye and other cereals are grown almost everywhere in the great plain of which European Russia is a part. The war of 1941 had the effect of extending the wheat-belt to the east, because the Ukraine, the country's chief granary, was overrun and ravaged by the Germans.

The Moscow Industrial Area

Situated on a tributary (Moskva) of the Upper Volga, at a crossroads of European and Asiatic commerce, Moscow has been for many centuries a commercial and industrial centre of prime importance. Since 1928 it has been what it was before Peter the Great built his city on the Neva—the political capital. Its population possibly exceeds eight million.

Before 1914 the two cities of Moscow and Leningrad (St. Petersburg), with their surrounding regions, well-nigh monopolised the manufacturing industries of European Russia—indeed of Russia as a whole, since the vast areas beyond the Urals were hardly thought of.

The Moscow industrial area reaches from Kalinin on the north to Tula on the south. It contains a coalfield; but because the deposits are brown coal, unsuitable for most local industries (though much is used in thermo-electrical generating stations and the whole area is now linked together in an electricity grid), large quantities of high-calorific fuel are imported: coal from the Donetz basin, oil from Baku and Grozny, coal from abroad via the Baltic. This is made possible by the excellent communications by rail, road and water; since the completion in 1937 of the Moscow-Volga canal the city has been an inland port, having connexions with the Baltic, the White Sea, and the Caspian. Moscow's system of electric power stations beats every other in Europe for power generating, and in the world is excelled only by New York's.

Tula and Kalinin have been mentioned; both have populations in excess of 300,000. Other important cities in the area are Gorky (the old Nizhne Novgorod; pop. about 900,000); Ivanovo (300,000), Yaroslavl (300,000), and Voronezh, which had a population of over 325,000 before it became one of the most fought-for cities in the Russo-German war. For the most part all these centres are largely concerned with the production of engineering and electrical equipment.

Leningrad's Importance

Second city of the U.S.S.R., Leningrad (St. Petersburg before 1914, Petrograd until 1924, when it was renamed in honour of the founder of the new Russian state) has a population of 3,300,000. Before the war of 1941 it was rapidly increasing in importance as an industrial and shipbuilding centre and a naval base. It held first place in the machine-building industry. It was also the chief port, through which much of the Soviet Union's commerce was conducted by the Commissariat for Foreign Trade.

The construction of the White Sea Baltic Canal (1933) added to Leningrad's importance in this respect; it permitted the export of vast quantities of timber from the northern forests. Then the Marinski canal system, linking Leningrad to Rybinsk on the Upper Volga and so with Moscow (via the Moscow-Volga canal completed in 1937), Stalingrad, and the Caspian Sea, still further improved its means of communication with the interior.

The Ukraine

Some 40,500,000 people, 80 per cent. of them Ukrainians and the rest Great Russians, Jews, etc., inhabit the Ukrainian S.S.R. Kiev is the capital; it ranks, with a population of 900,000, as the third city of the Soviet Union. The fourth is the great tractor and machine-tool producing centre, Kharkov (pop. nearly 900,000). Two other Ukrainian cities have populations of over half a million, viz. Odessa (600,000), formerly

RUSSIA IN EUROPE. From the Arctic Ocean and the White Sea, Soviet Russia extends southwards 1,500 miles to the Black Sea and the Caspian Sea. Westwards, it stretches 1,200 miles from the Urals.

an important grain port on the Black Sea, and Dnepropetrovsk, situated at the bend in the Dnieper.

For centuries the Ukrainian steppes were the happy hunting-ground of the Cossack horsemen; to-day, as for long since, they have been included among Europe's most productive farmlands. Much of the area lies in the black-earth region: the surface of the ground, varying from 18 inches to 4½ feet in depth, is black humus, which is extremely fertile. Here immense crops of barley, oats, rice, sugar beet, potatoes, sunflower, flax, maize, tobacco, cotton, are grown.

After 1918 the landlords and the primitive strip system of cultivation gave way to collectivisation. Each peasant family has its log cabin, with hens and rabbits and allotment, the produce being sold in the markets of Kiev and other cities and towns.

The Ukraine is not only agriculturally rich: it is one of Russia's principal industrial areas. From the Donetz basin—nearly equal in area to all the British coalfields combined—comes about 35 per cent of all the coal mined in the Union, and the whole of its coking coal. At Krivoi-Rog is one of the country's main deposits of iron ore.

Other minerals worked are manganese (at Nikopol), mercury, copper, and graphite. Oil is obtainable from Baku (pipeline to Rostov-on-Don, and Trudovaya on the Donetz). At Zaporozhe on the Dnieper the huge hydro-electric installation (Dnieper Dam) was destroyed by the Russians in face of the German invaders in 1941, but has been rebuilt. Kramatorsk has machine-building plants. Voroshilovgrad is famed for its locomotives. At Zaporozhe special steels are made

The Caucasus Area

The geographical area loosely called the Caucasus is divided by the Caucasus mountain range (in which is Mt. Elbruz, 18,467 ft., the highest peak in Europe) into the North Caucasian area and (south of the mountains) Transcaucasia. This Transcaucasia is shared between three S.S.R.s—Azerbaijan, Georgia, and Armenia; economically it is one of the richest regions in the Soviet Union.

The rugs of Daghestan and Azerbaijan and the carpets of Armenia and Georgia are famous. Large copper and manganese deposits are worked; about 25 per cent. of the world's production of manganese comes from the Chiatura region between Batum and Tbilisi in Georgia. Gold occurs in the mountains. A chain of hydro-electric stations use the water-supplies of Lake Sevan (Gokcha) and the mountain falls and rivers. Tbilisi (Tiflis), the

capital of Georgia, is an industrial centre based on hydro-electric power

There is a sub-tropical agriculture on the shores of the Black and Caspian Seas and in Transcaucasia Armenia has a tobacco industry whose product is said to be equal to the best Turkish Georgian tea is an important crop Cotton abounds; nearly 20 per cent. of the Union's cotton comes from North Caucasia Georgia supplies oranges, lemons, and tangerines. Maize, rice, barley, oats, and potatoes are grown in large quantities.

Margarine works, cotton seed oil works, sugar refineries, and canneries preserving fruits and vegetables, meat-packing plants, and extensive fish canneries based on the fisheries of the Black Sea, the Caspian, and Lake Sevan, are the principal industrial developments.

But to the world Caucasus means oil. The Soviet Union probably ranks third among the world producers of oil. A considerable contribution is made by the wells near Baku in Azerbaijan and those at Grozny and Maikop, north of the mountain range. A double pipeline conveys oil from Baku to Batumi on the Black Sea; there is another pipeline from Makhach-Kala on the Caspian through Grozny to Armavir, whence one branch runs north to Rostov-on-Don and Trudovaya, and another to the Maikop fields and so on to Tuapse on the Black Sea.

Another pipeline connects Maikop with Krasnodar, whence there is river and rail communication with the Sea of Azov and the Crimea. Fleets of modern tankers on the Caspian carry oil to Astrakhan, at the mouth of the Volga, whence it is transported into the heart of Russia

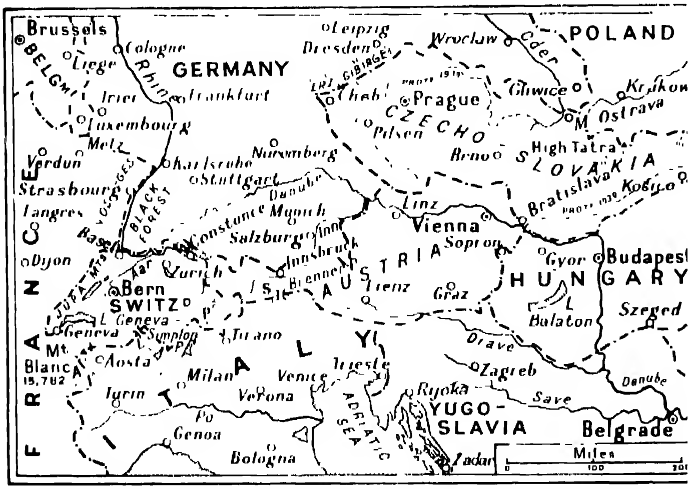
LESSON 12

Lands in the Heart of Europe

Ages ago a mighty wrinkle in the earth's crust arose along a line roughly east-west from the Himalayas to the Pyrenees. In Central Europe the wrinkle is known as the Alps and Carpathians; they were folded against the older elevations—even then worn and eroded, now reduced to relatively minor heights of the mountains of Upper Germany and the Bohemian Diamond.

The core countries of Europe all three without a coast are the maze of ridge and valley between the crests of the younger heights and the vast plain of Europe An exception is Slovakia, which lies within the curve of the younger mountains and was attached to Bohemia in 1919, when the new republic of Czechoslovakia was formed

A tangle of mountain folds of different origins and dates, the core is also a tangle of peoples of different origins and different development in civilized amenities. In the west, in Switzerland, French, Italians, and Germans have met; along the crest-line, Germans and Latins have intermingled. In the east, the Czechs, Moravians, and Slovaks—on the whole, of one stock—lie between Poles and Ruthenians on one side and Germans, Magyars, and Rumanians on the other.



CENTRAL EUROPE. Showing the landlocked countries of Switzerland, Czechoslovakia, and Austria. The vast area comprises a maze of ridge and valley.

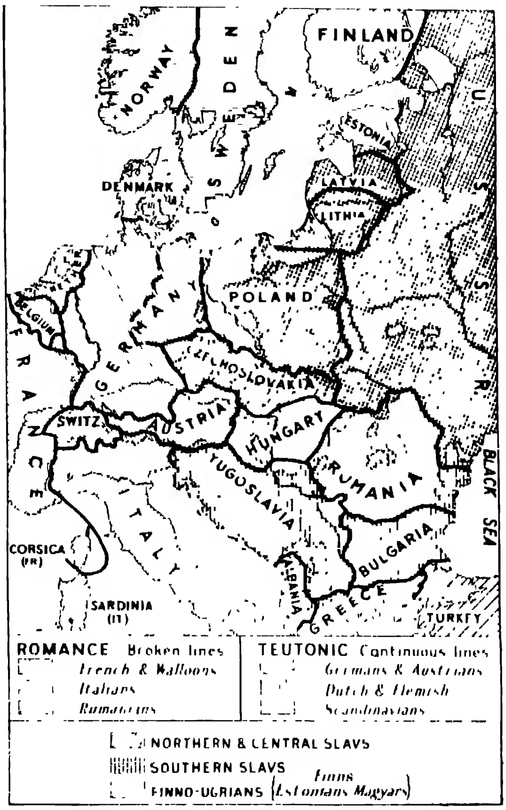
Within this area there is not much lowland; a coloured map showing heights under 600 feet in green and the rest brown displays very little green. In Switzerland there is none; in Austria there is only the basin of Vienna; in Czechoslovakia there are the Elbe outlet in the north-west and the Hungarian Plain in the south. Here rivers begin. Among those which have their sources in this region are the Rhine and Rhône in the west, the Elbe and Oder in the middle, the Tisza (Theiss) in the east. Across northern Austria flows the middle Danube, between Passau and Bratislava (Pressburg).

About 24 million people are congregated in this

central mass, which implies that the lower areas are densely populated. In fact, North-West Bohemia, Upper Moravia, the basin of Vienna, in the east, and in the west the lowest ground of Switzerland, the valley of the Aar, and the lakes all are extensions of the belt of dense population of Central Europe, the one extending southwards from the Elbe valley, the other southwards from the rift valley of the Rhine.

Here are the mountain playgrounds of Europe the Bernese Oberland, the Engadine, and the High Tatra of the Carpathians and many tourist resorts and sanatoria all related to the pursuit of sunshine at high altitudes, above the cloud screen of the humid lowland atmosphere. On the lower slopes are fir and pine forests.

Politically, Central Europe has been the scene of the most drastic experimenting since the end of the First World War in 1918. Only Switzerland remained secure and intact as a neutral, her neutrality safeguarded not only by her natural fortifications but because of her value as a meeting-place for the exchange of personnel and information.



EUROPE. Heavy black lines indicate political boundaries. The key represents the shading adopted to indicate linguistic divisions the distribution of languages spoken by the majority populations.

Switzerland

Switzerland comprises a low section between the Jura and the Alps between Lake Constance and the Lake of Geneva—and a high section, with the upper Rhône, Rhine, and Inn valleys. On the Rhine, where it turns into its rift valley, is Basle (Basel), with a population of 191,000 (a 1953 estimate). A gateway town where three countries meet, Basle is a route and traffic centre in the dip between the Jura and the Black Forest.

At the lower end of its lake is Zurich (409,000) on the route to the Engadine. Berne, the Swiss capital, is centrally placed on the Aar, and has a population of 153,800. Geneva, with some 155,000 inhabitants, on the Rhône at the lower end of its lake, is almost in France.

Pastoral farming is the main occupation in the mountain valleys. In the spring the cattle are driven from their winter quarters in the villages to the "voralp," the lowest strip of pasture just above the timber-line. As the snows melt, the cattle are led higher and higher up the mountainside to the "alp" proper, the highest pastureland just below the limit of perpetual snow. Here they spend the summer months, returning in the autumn for a short space to the voralp and so on back to their byres in the valley homesteads. From the summer milk, cheeses are made for export.

Of the industries of Switzerland, tourism is the most important in normal times. Hotels are everywhere, even high up near the mountain tops. The little city of Lucerne is reported to have accommodation for upwards of 200,000 visitors in a year, Interlaken for over 100,000 visitors. Abundant supplies of water power, by which cheap electricity is generated, make possible such industries as spinning, calico printing, silk weaving, chocolate-making, and the preparation of condensed milk.

Zurich is a machinery centre. Watchmaking is the economic stand-by of the Jura population. Geneva produces dynamos; it was the seat of the League of Nations, whose enormous palace dominates the lake, and it houses several international bureaux and agencies allied with the United Nations organization. The railways are mostly electrified, and several of the most important Continental lines pass through the country. The Simplon and St. Gotthard tunnels through the Alps lie within the frontiers of Switzerland.

Austria

Although Austria, last surviving fragment of the powerful Austro-Hungarian Empire, was absorbed by the German Reich in 1938 it still retained an individual character and importance.

Thus it was that after the Second World War Austria was recognized as a state with the same frontiers as in 1937. Occupying troops from Britain, U.S.A., U.S.S.R., and France eventually withdrew in 1955 and the country became independent again

It consists of two unequal portions : a long, narrow highland valley, that of the Inn, stretching east from the Rhine to the bend of the Inn above Salzburg ; and a square portion, with a backbone of the lower Alpine ridges and slopes extending to the south as far as the valley of the Drave and to the north to the middle Danube.

Vienna, with about 1,766,000 inhabitants, borders a lowland basin, which debouches at Bratislava into the Hungarian Plain, and receives the Morava from Moravia. It is on the route from Warsaw to the Adriatic Sea, where it crosses the route from Paris to Istanbul Farther up the Danube is Linz, with a population of 185,000, near the Bavarian frontier and with railway connexion to Prague. Graz (226,000) is in the south-east ; Innsbruck, in the west, on the river Inn, is much smaller, with only 95,000 inhabitants

Czechoslovakia

Product of the Versailles settlement in 1919, Czechoslovakia bore many signs of being an artificial creation. In 1938 the Sudeten (largely German-speaking) areas were incorporated in the German Reich as a result of the Munich Conference ; and in 1939 most of the rest of the state was declared the "Protectorate of Bohemia and Moravia," while Slovakia became "independent." Liberated by Russian forces in 1945, the country resumed its shape as the People's Democratic Republic of Czechoslovakia, but ceded Ruthenia to the U.S.S.R.

In the north-west the Czechs inhabit the Bohemian Diamond, a mountain-girt plateau which slopes down the Elbe gateway In the east is the inside of the northern portion of the Carpathian curve, Slovakia—a land which lies between the crest-line and, in the west, the Danube and in the east the Hungarian Plain.

Between them, in the Moravian passage-way, is Moravia, separating or linking, as accident determines, Bohemia and Carpathia; here the Upper Oder and the Morava form a natural route from Vienna to Breslau. The northern portion is part of Silesia, with its coalfields and other mineral resources. Praha (Prague), with a population of 922,000, is the capital ; it occupies almost the centre of Bohemia, on a tributary of the Elbe.

South-west is Plzen (Pilsen), with 117,000 inhabitants, a brewery centre, and the seat of the Skoda armament works. Brno (Brünn), having a population of about 273,000, is the chief town of Moravia Moravska Ostrava, with 180,000 inhabitants, is the Silesian gateway town. At Zlin, Thomas Bata created the greatest boot and shoe factory on the Continent. Bratislava (Slovakia) has about 172,000 people

The type of farming tends to change from the Germanic or humid Western European oats-rye-potatoes-sugar-beet type, which is dominant in Bohemia, to the wheat-barley type of the drier, sunnier lands prevailing in Slovakia, yet the superior ability of the Bohemian enables him to secure better yields per acre as a counterbalance. Slovakia produces wine—Tokay is just across the border Slovakia is the sheep country, the rest of the land having more cattle and pigs

The coal-mines are near Ostrava and in north-west Bohemia, formerly the chief home suppliers of Austria-Hungary. The beet-sugar of Bohemia and Moravia provided 900,000 tons of raw sugar in 1950. The chief products are sugar, timber, paper, textiles, crockery, glassware, iron and steel and manufactures thereof, machinery and machine tools, locomotives, arms and ammunition, and coal.

LESSON 13

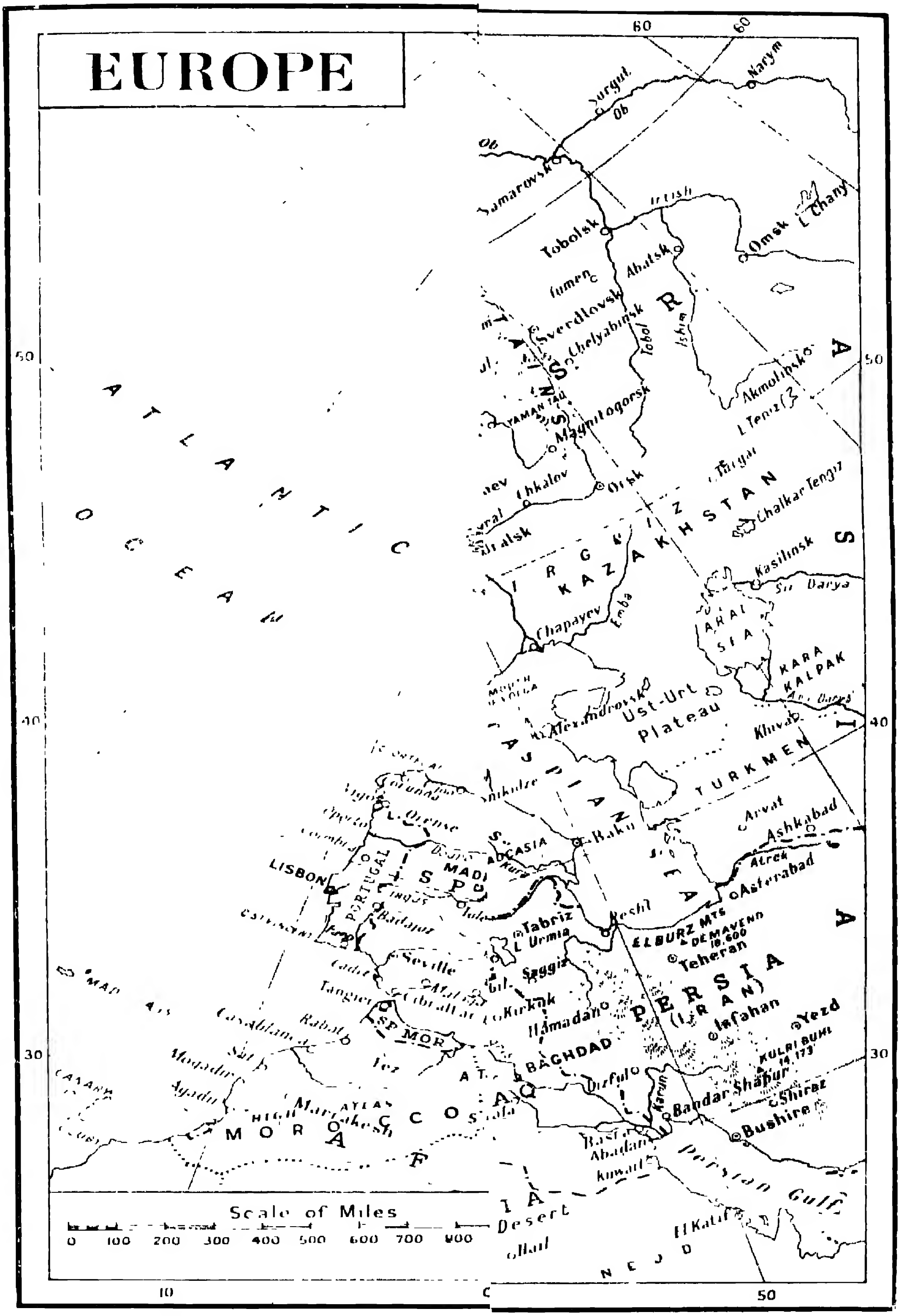
Hungary and the Balkans

From Vienna eastwards to the Black Sea the Danube runs through, or by, a succession of states whose frequently-changing frontiers may well be regarded as the map-makers' nightmare. On a physical map the state boundaries appear to be drawn at random, except in part along the actual courses of the Danube and the Dniester.

Political Hungary (Hungarian People's Republic) is essentially the Hungarian Plain. The People's Republic of Rumania is mainly the lowland surrounding Transylvania. The Federal People's Republic of Yugoslavia is the southern portion of the Hungarian Plain ; it rises to the Balkan Highlands, with a steep side to the Adriatic Sea. The Federal People's Republic of Bulgaria is a mountainous rectangle with a Black Sea coast.

As for the other Balkan but not Danubian states, Greece is a peninsula with a much indented coast and a curious mountain northern edge. The Republic of Albania consists of the eastern side of the open end of the Adriatic Sea with its mountainous background. Turkey in Europe is an historical and cultural relic.

From the seas the ways inland are, in general, difficult Only at Fiume is it relatively easy to achieve access to the lowlands from the whole



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Adriatic coast ; there are no sea or ocean interests from that direction. From the Aegean the combined Vardar-Morava valleys provide access from Salonika through Nish to Belgrade and the plains.

Even from Istanbul (Constantinople) across lowland to Edirne (Adrianople) and then up the valley of the Maritsa, access begins to be difficult at Sofia ; and the Bulgarian Black Sea coast, with settlements at Varna and Burgas, tends to be isolated.

The rest of the Black Sea coast, which is Rumanian, does not invite settlement The upland block of the Dobruja is an obstacle, while the delta of the Danube and its surroundings are not inviting ; the route through Wallachia is obstructed at the Iron Gates ; the route by Bessarabia is peripheral.

Ethnographical Groupings

Settlement of the population has tended to be controlled by the physical features ; the people dwell in the lowlands The rims of the Carpathians, the Balkan Mountains, and the Dinaric Alps have few inhabitants ; the coasts also are sparsely populated , only the Hungarian Plain has many people

The political boundaries must still be looked upon as an experiment, for they follow neither the physical features of the land nor the numerical distribution of the people They represent attempts to group folk ethnographically.

The Magyars populate Hungary. They are an odd people , their speech is unique, their outlook is foreign to European standards. The ground of their existence is lowland fit to ride over, not lowland fit to cultivate in prairie fashion for crops to sell

The Rumanians form Rumania ; it was the existence in Transylvania of a major Rumanian element among the people that gave to Rumania in 1919 an extension of territory with all its easy outlets to Hungary which they were unable to hold.

South of the line of the Drave-Danube live the South Slavs – the Yugoslavs (from west to east, the Slovenes, the Croats, the Serbs) and the Bulgars. Politically, the South Slavs were held apart from the North Slavs – the Czechs, Poles, and Ukrainians – by non-Slavs, i.e. Germans, Magyars, and Rumanians.

In 1918 the triune S-C-S (Slovene, Croat, Serb) confederation became Yugoslavia, separated from the Bulgars. The Albanians made Albania, the Greeks Greece. As recently as 1946 a mutual exchange of their Slovak and Magyar populations was arranged between Hungary and Czechoslovakia ; the transfer was completed by about 1950. At the same time many Germans were expelled from Hungary

First of the cities in the region is the Hungarian capital, Budapest, the historic twin-city of the Hungarian Plain, composed of two towns, Buda and Pest, on the Danube; it has 1,058,000 inhabitants. Second in size is Istanbul, the largest seaport of the area, with a population of 1,000,000; by its situation on the Bosporus it is a boundary city where Europe and Asia meet ; it is a terminal station on an Orient Express route by railway, and an airport.

Next is Bucharest, with a population of 948,619 ; the capital of Rumania, it lies back from the Danubian marshes on the Wallachian plain Athens, the Greek capital, with about 559,000 inhabitants, is the second port of the area, if one counts as part of the commercial city its outport Piraeus with a population of 185,000. Salonika (Thessaloniki, 216,838) comes next as the second port of Greece, the terminal port of the Vardar-Morava route. With these two must be ranked Belgrade, the Yugoslav capital (388,250), at the other end of this route, and Sofia (435,000), the Bulgarian capital.

On the Hungarian Plain are Szeged and Debrecen, in the valley of the Tisza, which is the heart of Hungary ; and Subotica, now in Yugoslavia, near Szeged Zagreb (Agram ; pop

BALKAN STATES, as reconstituted after the Second World War.

290,000), on the Save, is the capital of the Croats; Chisinau, on the Dniester, is the capital of the Bessarabians.

The Hungarian and Wallachian-Moldavian plains are wheat lands with the typical Continental climate of hot, dry summers and the frozen winters and scanty rainfall of the best Russian steppes. Barley, oats, and maize are grown; in Rumania almost half the arable is devoted to maize. Root crops are not extensively cultivated, for climatic reasons; but the penetration into the area of Mediterranean climatic conditions justifies extensive vineyards, which yield notably the currants of Greece, the wines of Northern Hungary, and local wines. Tobacco is a crop of local importance in all the countries, particularly in Bulgaria and Turkey.

Cattle-breeding, in earlier times the chief occupation of the Hungarian people when much of the plain was natural unenclosed pastureland, is still prominent. Horse-breeding continues on a large scale. Rumania is still an essentially agricultural country, and so too is Yugoslavia as indeed are the Balkan countries as a whole.

After the Second World War, Hungary, Rumania, Bulgaria, and Albania were drawn within the Soviet sphere of influence, with much economic co-operation. Following the example of the Soviet Union, large estates in these four countries were taken over and distributed among the peasants in small holdings, with the ultimate aim of developing the land by collective agriculture. Even so, it was planned to change the primarily agricultural economies of Hungary and the Balkan countries into industrial economies.

Transylvania, wrapped round by the Carpathians and the Transylvanian Alps, is a high plateau with a moderate rainfall. The mountain slopes are wooded, but most of the country is well-suited for pastoral pursuits. Its mineral riches are the lure which has given rise to much prolonged and intense rivalry between Rumania, to whom Transylvania was awarded in 1919, and Hungary, to whom it belonged before the First World War.

Gold, silver, copper, and lead are all worked, and there are deposits of coal and iron ore. The armistice terms of 1944 between the Allies and Rumania returned Bessarabia and Bukovina to Russia, and Transylvania (ceded by the Axis to Hungary in 1940) to Rumania.

Good quality coal is mined in the Pecs district of Hungary, bituminous and brown coal and lignite in other parts of the country. Yugoslavia has considerable brown coal deposits, particularly near Cuprija, between Belgrade and Nish, where the mines are state-owned; near Sarajevo; and in the valley of the Save between Ljubliana and Zagreb. Bulgaria and Greece have little coal. Hungary's bauxite deposits are among the largest in the world and they supply an aluminium industry.

Yugoslavia has iron deposits, the most important mines being in Bosnia; copper is mined at Bor in Serbia; lead at Trepca and Mezica; chrome near Skoplje; salt at Tuzla in Bosnia, where it is the foundation of a chemical industry.

Rumania's unique importance in the economy of South-Eastern Europe is derived from her oilfields. The chief centres are at Prahova and Dambovitza, in the Ploesti district, north of Bucharest, Buzau to the east; Giurgiu, south of the capital on the Danube facing the Bulgarian port of Ruschuk; and Bacau, in Moldavia.

Pipelines run from Campina and Giurgiu to Ploesti, thence to Constanta on the Black Sea (crossing the Danube by the bridge at Cernavoda), the base of the tanker fleet. Little of the oil is exported crude, most of it is treated in home refineries, of which several of major importance are concentrated at Ploesti. Important as they are to Rumania and the adjoining countries, the oil-wells produce but a fraction of the world's supply.

With a typically Mediterranean climate, Greece presents some contrasts with its Balkan neighbours. Minerals are in great variety, iron, lead, copper, zinc, lignite, and aluminium are worked. The general climate favours the growth of such Mediterranean fruits as currants, olives, lemons, oranges, and figs. The Greek islands rival the mainland in this almost sub-tropical produce. There are rice fields near Salonika, and tobacco is grown.

The Piraeus and Salonika are among the most important ports of the Near East, and from them the Greek merchants conduct a large maritime commerce.

LESSON 14

Italy and its Islands

THE Riviera—Nice, Monaco, Monte Carlo, Mentone, San Remo—is the sea edge of the well-nigh impassable slopes of the Maritime Alps on the Ligurian Sea. From the Maritime Alps the chain runs north round the headstreams of the Po to the Graian and Pennine Alps, where the heights curve to the east: here on the Alpine slopes are the roots of the chief Mediterranean peninsula—Italy.

The frontier is sinuous and mountainous, but does not follow the crest-line entirely; in the east it runs almost due south from the

edge of the Drave valley to the Adriatic Sea near Trieste. With the peninsula go the islands Sicily, Sardinia, and Corsica ; the last is geographically Italian but politically French.

From the Riviera east to Ancona is the northern curve of the Ligurian and Etruscan Apennines, which form with the Alps a hairpin enclosure variously known as the valley of the Po (for that river drains it and helps to make it), as the Plain of Lombardy, and as Continental Italy (because its climate tends to be Continental rather than typically Mediterranean).

The coastline of the Gulf of Venice and the Northern Adriatic across this hairpin is accidental, for the Alpine streams bring Alpine detritus and carry it southwards, until the Apennine wall forces the waters eastward to continue silting up the gulf , the Po is deltaic, and Venice is a lagoon city.

The Apennines continue south and sweep towards their continuation in Sicily , within them on the west is hill country, with small plains in the Arno and Tiber valleys and near Naples

Lowland is lacking in the true peninsula, though the " heel " is mainly lowland, for on the east and round the " toe " the coastal plain is narrow. The islands, similarly, have little lowland. In the south the winter rainfall and the summer droughts, the relative dryness throughout the year, and the absence of pasture, are characteristically Mediterranean. The latitude is lower than 45° N , with the consequent shortness of twilight

Between Marsala in Sicily and Bizerta in Tunis, almost due west, is the 120-mile-wide gateway between the western and eastern basins of the Mediterranean Sea , the southern tip of Sicily has the latitude of Algiers and Cadiz The Adriatic Sea is a marine cul-de-sac, a backwater.

Under the Peace Treaty of 1947 Italy ceded four Alpine frontier districts to France ; a considerably larger territory to Yugoslavia, including the port of Fiume (now combined with the Yugoslav port of Sušak and renamed Rijeka) ; the Dodecanese archipelago to Greece ; and a small island to Albania. An enclave based upon Trieste was made a Free Territory, but the occupying powers (Britain and U.S.A.) restored Trieste and part of its immediate district to Italy.

Italy contains 47 million people, rather fewer than Britain Rome, with well over a million and a half, and Milan and Naples with more than a million are the largest cities ; each is a centre for a section of the country From Turin (pop. 737,000) eastwards in the hairpin to the coast is a belt of dense population comparable with those of the Rhône valley, the Rhine rift and Belgium, yet even here the towns are not sizable. The largest are Bologna, with a population of 350,000 ; Venice, with 323,400 ; Padua, with 173,000 ; and Brescia with 147,000. Trieste (pop. 273,000) lies across the gulf from Venice.

On the west side of the Apennines, in addition to Rome and Naples are Genoa, a port with a population of 683,000 ; Florence, a historic city at the head of the Arno valley, with 391,000 inhabitants ; Leghorn, with 146,000, the port for the Arno lowland. Bari, with a population of about 273,000, is the only largish town on the east coast of the peninsula ; between " heel " and " toe " is Taranto (174,000).

ITALY. Largest of its numerous islands are Sicily, Sardinia, and Elba Corsica, geographically Italian, is politically French

Products of the Land

Sicily is, on the whole, the most densely populated island of Europe. Palermo has 501,000 inhabitants, Catania about 300,000 and Messina 221,000. Sardinia has about two

million people all told, as compared with over four million in Sicily

As a Mediterranean land, Italy is normally a land of wheat, wine, and oil. Sicily is the chief wheat-growing area; considerable quantities are grown in the "heel" and between the Po and the Etruscan Apennines. The northern side of the Lombardy plain produces rye; barley is grown largely in Sicily, Sardinia, and the "heel." Maize, from which polenta, favourite food of the people of North Italy, is made, is grown on the Lombardy Plain

The "heel," Lombardy, and Tuscany yield oats; rice is grown in Piedmont and Venezia. Italy is the only country in Europe where rice is grown to any extent. The semi-Continental climate of the "hairpin" justifies the cultivation of potatoes in the west and sugar beet in the east. Tobacco is grown in the "heel."

Tuscany, Piedmont, and Campania produce the most wine in an area truly Mediterranean in climate. Cultivation of the olive is confined to the peninsula, the chief areas being in the south and in Sicily. Lemon culture is almost confined to Sicily. Cattle and pigs are most numerous on the Lombardy Plain, sheep in Sardinia, in Latium, near the capital, and Tuscany

Italy's Industries

The comparative lack of coal and oil is compensated in part by hydro-electric establishments, especially in the north, where textiles in cotton, natural and "artificial" silk (rayon, etc.) are produced. One of the chief minerals is sulphur, largely produced at Catania in Sicily, used in the manufacture of sulphuric acid and other chemicals. In addition Italy vies with Spain as the world's chief producer and exporter of mercury (quicksilver). Since the Second World War she has produced from three million to four million pounds a year.

Particularly on the Lombardy Plain the mulberry is grown extensively, and silkworms flourish. It is a great silk-producing region. Como, Milan, and Bergamo are the towns chiefly engaged in the industry; Milan supplanted Lyons as the chief silk market for Europe soon after the First World War. Turin, with important iron and steel industries, is one of the world's principal areas of motor-car manufacture.

Densely populated (if only in parts), Italy is not by any means self-supporting; and in normal years she imports large quantities of cereals from the U.S.A. and the Argentine, raw cotton from the U.S.A., Egypt, and India, and oil from the U.S.A., South-West Asia, etc.

Exports are made up of wine, silk, cotton goods, artificial fibres, fresh and preserved fruit, hemp, woollen goods, motor cars, cheese (e.g. Gorgonzola and Parmesan), and marble

The chief ports are Genoa and Naples. Leghorn is more important than Brindisi. Venice has rivals in both Trieste and Rijeka (Fiume) at the head of the Adriatic Sea. Sicily is served by Palermo, Messina, Catania, and Syracuse; Sardinia, by Cagliari

LESSON 15

The Iberian Peninsula: Spain and Portugal

A MASS of very ancient rock, an elevated plateau, forms the core of the Iberian Peninsula, which is divided between Portugal and Spain. Against the bastion of this rock rose up the western end of the world's greatest wrinkle, the Alps-Carpathian-Caucasus-Himalayan uplift.

Between the central plateau called the *meseta*, and the wrinkle's end, called the Sierra Nevada, is the trough of the Guadalquivir and Andalusia; between the bastion and the Pyrenees is the basin of the Ebro and Catalonia. East of the bastion lies the Mediterranean; west, the Atlantic Ocean; south is the desert land of North Africa; north is France.

The bastion is a knot, a convergence. From the south came the mountains as a continuation of the Atlas Mts. Also from the south came the Moors and Islamic culture, and the Mediterranean climate with its wonderful winter weather and its summer heat and dryness.

The western side of the bastion is oceanic. Hence Portugal is separated from Spain and has an oceanic marginal climate, and an outlook westward, which led to the explorations of the captains sent out in the 15th century by Prince Henry the Navigator, and the former possession by Portugal of Brazil.

Eastwards Spain has contact with the Latin lands, with Rome and all that Rome stands for. In the extreme south Cadiz and Huelva lie on the ocean, and thus Spain, like Portugal, took advantage of the southerly latitude, for here the Trade Winds blow in the summer months from the peninsula south-westwards and these winds assisted Columbus in his journeys to the West Indies. But for these winds, gold from the Americas would not have created the power of Spain, which provoked English resistance and resulted in a British Empire.

Physically, the land is elevated, arid, rocky, dusty, rising here into saw-toothed ridges, the Sierras, falling there into gorge-deep river trenches, such as that of "the gash" of the Tagus. Near the coast are pockets of lowland, especially near Lisbon and Seville and in more

constricted ways near Cartagena and Valencia. The total area of the peninsula is rather larger than that of France; five-sixths is Spain, one sixth Portugal. The population of the peninsula is about 36 millions, of whom rather less than a quarter are in Portugal.

Centres of Population

Portugal contains but two, Spain 21 places, with a population of 100,000 and over. Lisbon, the Portuguese capital, with 750,000 inhabitants, is the third city in the peninsula. Oporto, at the mouth of the Douro, has a population of 280,000. Madrid, with a population of 1,641,000, is in the heart of the meseta, south of the Sierra de Guadarrama, and is the largest city of the peninsula. Barcelona, on the north-east coast, has 1,288,000 people.

Of the smaller Spanish provincial cities the largest is Valencia, with 515,000 inhabitants; next is Seville (383,000), above the marshes of the lower Guadalquivir, the "Great River" Malaga (pop 278,000) lies on the narrow coast hampered by the Sierra Nevada to the north, with Morocco to the south across the waters Bilbao, the chief port of the Biscayan coast, has about 233,000 people. Saragossa (Zaragoza), well up the Ebro valley, some 267,000

Murcia (224,000) lies inland and north of Cartagena, a smaller place, with Alicante to the north-east; all three are notable in connexion with the typically Moorish garden cultivation on irrigated *huertas*, and the production of oranges and natural silk. Granada, with a population of 156,000, is to the north of the Sierra Nevada and has a magnificent site 2,000 feet above the sea level. Other places well known by name, such as Toledo, Cadiz, Almeria, Corunna, and Valladolid, have about 100,000 or fewer people apiece.

Spain is a predominantly agricultural country, and most of the land is under cultivation. In the north-west maize is grown, with beet, flax, and potatoes, and there are extensive vineyards. Such are the abundant grasslands, thanks to Atlantic rains, that a third of Spain's cattle are pastured here. On the meseta, where moisture is often deficient, large areas are unsuitable for cultivation. Wheat is the principal grain crop, oats and rye are grown in the more mountainous parts. The vine is plentiful, and in the south olive plantations abound. Pastoral farming is the pursuit of many, and half Spain's sheep are on the meseta.

The Mediterranean Frontage

Southern Spain has a Mediterranean climate and typical Mediterranean products Oranges and lemons grow freely, vines are better than anywhere else in the peninsula; the wines of Jerez (sherry) Malaga, and Almeria are well known. Raisins come from Malaga and Alicante. Cotton and sugar are also grown in irrigated areas.

Along Spain's Mediterranean frontage the soil is thin, rainfall light, and resort must be had to artificial irrigation. Vines, olives, oranges, lemons, etc., are grown. Silk culture is carried on in Valencia and Murcia. In the Ebro basin olives, vines, and cereals are the staples.

Spain's most important coal deposits are in the province of Oviedo; Gijon is the port through which the coal is shipped to other parts of the country Even more important are the iron-mines near Bilbao and in Santander. The ore is haematite with an iron content of about 50 per cent., and in normal times large quantities are shipped from Bilbao and Santander to British ports Haematite deposits also occur on the meseta, in Guadalajara, and Teruel to the east of Madrid. More iron deposits are worked in southern Spain, particularly in the Almeria, Murcia, and Huelva provinces.

In Huelva are the famous Rio Tinto copper mines. Almaden in Ciudad Real is famed for mercury. Seville, Malaga, Almeria, Cartagena are the chief ports from which the ore is despatched. Seville, a flourishing port, has iron foundries and other industrial establishments. High up on the Mediterranean coast

IBERIAN PENINSULA: its relation to France and to North Africa.

Barcelona, with a fine sheltered harbour, is not only a great seaport but a busy industrial city of the first order one separated by a gulf of language, tradition, and business interest from the rest of Spain. Textiles and engineering are the basis of its trade Saragossa, well up the Ebro and standing on both banks, has iron and steel works and sugar refineries.

Portugal is, on the whole, more densely peopled than Spain, of which it is (except for minerals) a western extension. The narrow Spanish valleys give place to wider valleys and coastal plains, the sparse population of the meseta to the denser concentration of people round Oporto, the port wine country.

Among the minerals are sulphur, copper, lead, coal, tin, silver, and iron ; salt is obtained from lagoons and salt marshes There are large forests of cork and oak trees, and plants of semi-tropical nature flourish.

Gibraltar

In the very south of Spain is the great British bastion of Gibraltar. "The Rock" has an area of rather less than two square miles, and in normal times the civilian population numbers some 25,000 , in addition there are large numbers of military and naval personnel. The industries are unimportant, the civilians being engaged for the most part in the government dockyards and establishments.

Since 1704 Gibraltar has been a British colony, and its immense strategic importance was never so much manifested as in the Second World War when the Italians and their German allies did their best to close the Mediterranean to British shipping. That they failed was attributable in large measure to the fortifications and facilities of "Gib."

Malta

Not quite a thousand miles to the east, and rather more than half-way from Gibraltar to Alexandria, lies that other British bastion, Malta, in the channel between Sicily and the North African coast Larger than Gibraltar, it has an area of 95 square miles; Gozo, an island to the north-west, has some 26 square miles; between them is Comino, over 1 square mile The combined population is well over 300,000, excluding military, naval, and air personnel. Considerable quantities of food-stuffs are produced The women are skilled at lace-making

Malta's importance is derived from its position in the middle of the Mediterranean highway. Since it finally became British in 1814 it has been developed as one of the chief bases of the Royal Navy as well as a principal port of call for the world's shipping , and its long history includes its magnificent defence against Italian and German air onslaughts from 1940 to 1943.

LESSON 16

Asia : Largest of the Continents

LARGEST of the land divisions of the world, Asia covers an area of more than 17½ million square miles. The mainland of the massive continent extends for hundreds of miles beyond the Arctic Circle, and in the south it almost touches the Equator. From Cape Chelyuskin in the extreme north of Soviet Asia to Cape Buru on the Malay peninsula is a distance of 5,350 miles

Cape Baba in Asia Minor is its farthest west ; and 5,990 miles away is East Cape (Cape Dezhnev), where Asia looks across the Bering Strait to America. Larger than all the Americas put together, half as big again as Africa, four times the size of Europe, Asia with its islands includes nearly a third of the land surface of the globe

Asia is a continuation of Europe—considering their respective sizes it would be more appropriate to say that Europe is the north-western extension of Asia—and the Urals, which are usually taken to be the dividing line, represent no sharply defined differentiation in physical features or in climate, in vegetation or in animals, still less in the ethnographical features of the people and their history.

Both continents have been linked from the beginning of time, and ever since man became man Asia and Europe have had their constant interactions. Some of the earliest civilizations —the earliest of all, if Mesopotamia antedated Egypt had their rise on Asiatic soil All the great world religions were born in Asia. Art and literature, economic and political systems, social organization of an advanced type, flourished and decayed in Asia when Europe was still inhabited by barbarian tribes.

Physically, Asia is a continent of contrasts The Himalayas and the 700-mile-wide plateau of Tibet are contrasted with the Siberian plain. The coldest spot in the world, in the Lena valley, opposes the heat in Indonesia. The wettest place in the world, in Assam, is in the same latitude as the driest stretches of the Arabian desert.

The monsoons—very wet in the hottest months, very dry in the coolest months—characterise India, and are an extreme example of seasonal rainfall variation ; they are opposed to the steady drought of the Thar desert in India and W. Pakistan and the steady downpours of Malaya.

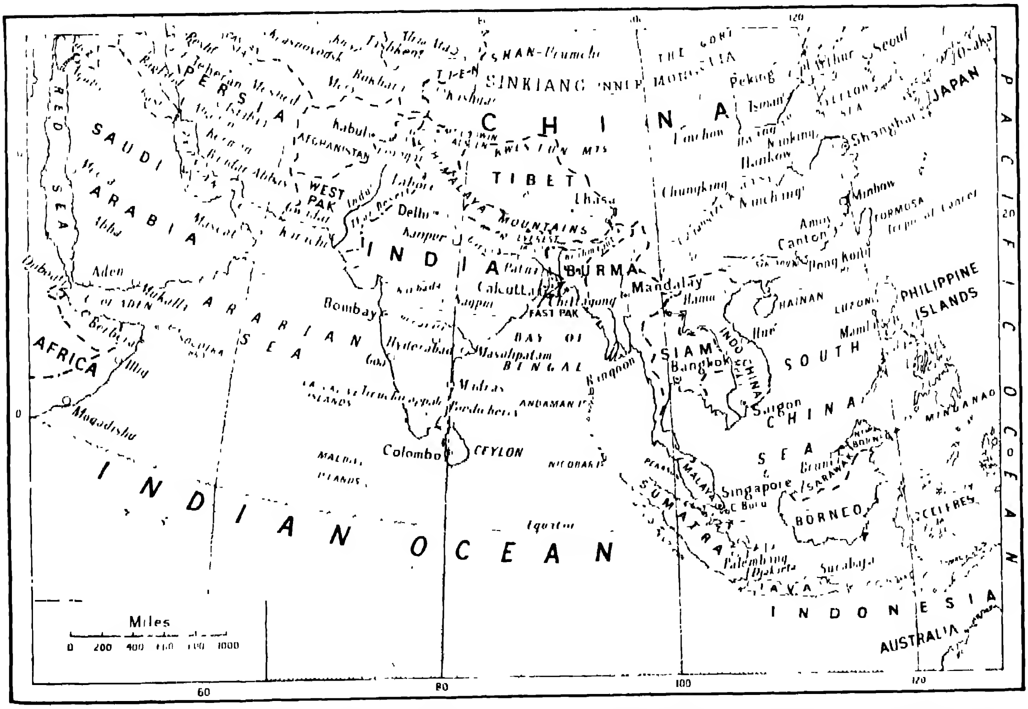
There are huge forests in Asia. The coniferous and deciduous forest extends over the greater portion of the northern plain, and the tropical forest clothes the slopes of the south

There are grasslands, the steppes, once the roving ground of the Mongol hordes but now, at least in the Soviet lands, yielding to the peaceful invasion of the cultivator. There are wide-spreading riverine lowlands: those of the Ganges, for example, extensive tracts of stoneless, treeless alluvium.

Politically, Asia consists in the main of the republic of India and the republic of Pakistan, the People's Republic of China, another vast territory which after years of political experimenting, interrupted by a Japanese invasion on a colossal scale, attained a degree of unity Japan, called at one time the Britain of the Orient (just as at another time her people were called the Prussians of the Far East); the republic of Indonesia (the former Dutch Indies except for W. New Guinea); and, greater than any of these in territory if not in population, the Asiatic provinces of the Soviet Union, stretching from the shores of the Caspian to the waters of the Pacific, contiguous to American Alaska and the islands of Japan.

There are other states, in different stages of political growth and economic condition. The Turkish republic occupies the whole of Asia Minor (Anatolia) with a small extension across the Dardanelles into Europe (Trakya). Iraq, one of the states born of the First World War, emerged from the position of one of Britain's mandated territories. Syria is an independent republic. Persia (or Iran), with an economy resting very largely on its immense oil resources, ranks as an independent state. Siam (Thailand) is a monarchy Afghanistan is a somewhat backward kingdom. Arabia assumes increasing importance with development of her vast oil resources.

Indo-China consists of a number of republics and kingdoms, before the Second World War the whole area was called French Indo-China. The Philippines, ceded by Spain to the U.S.A. after the war of 1898, made great strides towards nationhood under American guidance Burma, in British possession from 1885 to 1947, is now an independent republic But the British Commonwealth is still represented by Malaya, North Borneo, and such outposts as Aden and Hong Kong. Altogether, Asia is a continent where millions upon millions of white, yellow, and brown people are weaving fresh and vivid strands into the human tapestry



SOUTHERN ASIA. In the southern half of the largest of the continents are several great countries with an immense variety of different peoples. More detailed maps of the countries are in the pages immediately following. A general map of Northern Asia is in page 888.

LESSON 17

The Near East: Turkey, Syria, and Israel

ALTHOUGH there is no general agreement as to the areas covered by the terms Near East and Middle East, centuries of commercial intercourse have accustomed us to include in the Near East the countries of Turkey in Asia (Asia Minor), Syria, and the adjoining lands of Israel, Lebanon and Jordan. This is the division adopted here. In the next Lesson those countries which fall within the description of Middle East, namely Iraq, Persia (Iran), Arabia, and Afghanistan are dealt with.

Asiatic Turkey consists in the main of the great limestone plateau of Anatolia, buttressed on the south by the Taurus range, on the north by a series of ranges following the shores of the Black Sea. The eastern extension of the Taurus is called the Anti-Taurus.

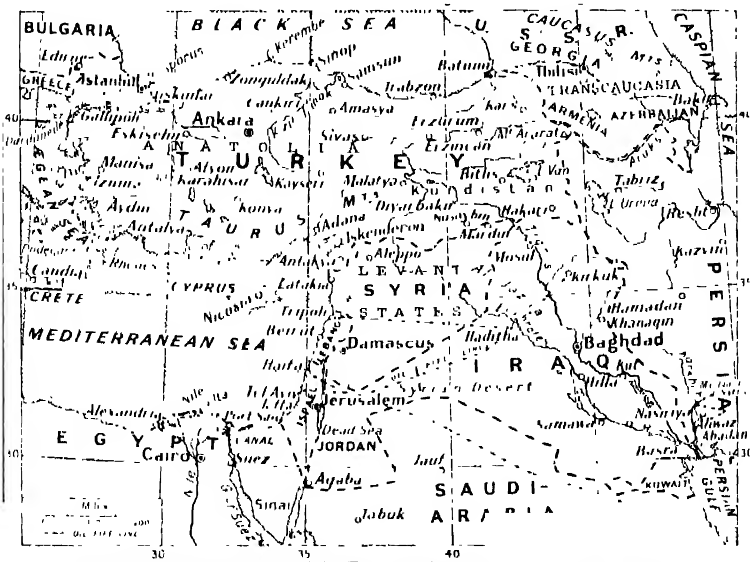
In the centre the land tends to be flat, forming a great elevated plain; the mountains constituting its edge approach the sea so nearly as to leave room for little more than a coastal fringe. Passes cross the Taurus ranges, the most famed being the Cilician Gates, leading to Adana and Alexandretta; by this route marched the armies of the Persian kings and of Alexander the Great.

The plateau, which averages some 3,000 ft. in height, has some considerable summits, e.g. the ancient volcano Eroiyas or Argaeus Dagh (12,850 ft.); Bulgar Dagh (11,400 ft.); Mt. Ida, overlooking the site of Troy; and Great Ararat (16,945 ft.) in Turkish Armenia, which in Biblical legend was the resting-place of Noah's ark. Ionia, the strip of fertile valleys and coastlands bordering the Aegean Sea, was for many years the chief centre of Greek culture before this crossed to the mainland.

Flowing through mountain gorges, the Turkish rivers are of little use in commerce, though they are invaluable for irrigation. The Mendere is the ancient Maeander, from which our word meander is derived. The Mesopotamian rivers Euphrates and Tigris have their sources in Turkish Armenia.

Another interesting physical feature in this easternmost section of the country is Lake Van, 5,640 ft. above sea level and six times the area of Lake Geneva. Of the rivers that flow north to the Black Sea the most important is the Sakaria. Farther east, Kizil Irmak is unnavigable owing to gorges and rapids.

Although the central plateau is deficient in water-supply the soil, largely volcanic in origin (Turkey is frequently shaken by earthquakes), is very fertile. Farming methods tend to be antiquated, and in the 1950s ambitious programmes of modernisation were only just beginning to touch the country's basic means of livelihood. There are state-directed schemes of irrigation. Figs are extensively cultivated, particularly in the Mendere valley; Smyrna (Izmir) and figs are synonymous.



TURKEY and the other countries which constitute the Near East.

Cotton, grown for thread and also for its seed-oil, flourishes in the lower Sanabat (Hermus) valley, to the north of Izmir, and especially in Cilicia centring on Adana. Turkish tobacco, now world-famous, was developed originally by British firms; it comes from Samsun, on the Black Sea, Izmit, and Izmir. Opium is grown at Afyon Karahisar and Konya. Olive oil is the speciality of the vilayet of Aydin, to the south-east of Izmir, and it is the basis of the city's soap industry. For the rest, Turkish farmers produce cereals, dried fruits, almonds, skins and hides, furs, wool, linseed, etc.

Goats, small hardy horses, and sheep are raised.

It is time and experience rather than raw materials that Turkey lacks for industrialisation. She has at Kayseri the largest textile factory in south-western Asia. Turkey's first blast furnace was lit in 1939 at the Karabuk iron and steel works. There is a coalfield at Zonguldak, on the Black Sea. Chromite, lead, zinc, borax, and manganese are among the minerals worked ; salt and sulphur are mined for the chemical industry.

Ankara (Angora), in the heart of the Anatolian tableland, has been the capital of the Turkish republic since the republic's proclamation in 1923. It was chosen chiefly because the old historical capital, Constantinople (now Istanbul), on the Bosporus, was within too easy reach of foes. The new quarter of Yenishehr is a memorial to Mustafa Kemal Ataturk (1880–1938), the first president of the Turkish republic and the maker of modern Turkey. Ankara's population is 295,000. Istanbul has 1,000,000 population. Izmir, formerly Smyrna (230,000), is the principal port.

The total population in 1950 was a little less than 21 millions. Most are Turks, including many returned from Greece and other parts of the former Turkey in Europe as the result of exchange-of-population agreements following the Turkish triumph in the war with Greece in 1923. In the eastern provinces are Kurds, Circassians, Armenians, etc. In the towns there is a considerable Jewish element. The vast majority of the people are Muslims in religion, though Islam is no longer the established faith.

Syria and Lebanon

For thousands of years Syria using the word to cover the territory lying between the Anatolian mountains to the north, the desert to the east, and Jordan to the south—has been the home of highly-civilized communities. Their strength has lain in commerce rather than in military might, and it is only in comparatively recent years that there has been anything approaching an independent Syria.

Lying on the great coastal highway from Europe through Asia into Africa, its history has been one long succession of conquests and foreign occupations. Assyrians and Babylonians, Persians, Romans, Saracens, Crusaders, and Turks held it in turn for long or short periods. The Turks were dominant until 1918 when Allenby at the head of a British army drove them out.

In due course Syria was mandated to France by the League of Nations. Two republics were set up under French suzerainty : Syria proper, with its capital at the ancient city of Damascus ; and Lebanon, the coastal strip about 120 miles long and from 30 to 35 miles wide, with Beirut as its chief town.

In 1941 both Syria and Lebanon were declared by General Catroux, acting on behalf of the Allies, to be sovereign independent republics. The total area is estimated at about 75,600 square miles, the population at rather more than 4,600,000, the majority of whom are Sunni Moslems.

The level strip along the Mediterranean shore is very fertile. It is well watered by rains precipitated when moisture-laden clouds encounter the heights of Lebanon and Lebanon's continuation, the Jebel Ansariya and Amanus. The principal rivers are the Orontes and the Leontes, which reach the sea through deep-cut gorges. The north-eastern corner of the country is steppe, green in spring when it catches the fringes of the Kurdistan rainstorms, brown and bare in summer. South of the Euphrates runs a line of desert hills, and much of the country hereabouts is suitable only for a nomadic state of living.

As the borderland between the Mediterranean basin and the Asiatic steppes, Syria shares the flora of both. More particularly in the coastal areas all the typical Mediterranean crops and fruits are grown ; elsewhere irrigation is necessary for even subsistence husbandry. As of old, flocks and herds form the chief wealth of the nomad tribesfolk.

So far as is known, mineral resources are poor, but there are indications of oil in places. Building stone has been worked in the Lebanon quarries from time immemorial. Flour, oil, soap, cotton, and silk thread are among the chief industrial products. The silk industry has its centres at Beirut, Aleppo, Tripoli, and Latakia (also famous for its tobacco).

Aleppo has a population of about 381,000 ; Damascus comes next with 373,000, and then Beirut with 201,000. Homs, Hama, Tripoli, Antioch, Latakia, and Zahlah in Lebanon, have populations ranging from approximately 50,000 to 20,000.

Beirut is capital of the Lebanon and is one of the greatest ports of the Levant. There is railway communication with Turkey and Israel and via Aleppo with Baghdad. A motor transport system connects Damascus with Baghdad by the direct route across the desert. Banias and Tripoli are termini of oil pipelines from Iraq.

The Republic of Israel

The " Holy Land " of Christians and Jews is now the republic of Israel. It was founded in 1948 immediately after Britain relinquished the mandate to administer what was then known as Palestine—a mandate which it had exercised

since the break-up of the Turkish empire in the First World War. The population is mainly composed of Arabs and Jews. The Arabs are the indigenous people, inhabitants of a land their fathers lived in for countless generations.

The Jews are comparative newcomers, yet the country is to them the cradle of their faith and race, since two thousand years ago the land was theirs, as the Bible tells. The Arabs are Moslems, primitive agriculturists or pastoralists, living for the most part in villages or as nomads. The Jews are primarily townsfolk and industrialists.

When the first census was taken under the mandate in 1922 the population was 750,000; in 1931 it was over a million; in 1953 it was estimated at 1,655,700, of whom about 1,480,000 were Jews, 125,000 Muslims, 42,000 Christians, and 16,000 Druses.

As in Biblical times, Jerusalem is the capital; held in highest honour and reverence by Jews, Christians, and Muslims alike, it is the centre of innumerable religious organizations. At the end of 1951 its population (Israel's portion; modern city only) was 127,000. Tel Aviv-Jaffa had 350,000 people. Haifa, the principal port (160,000), has a modern harbour and is the terminus of the pipeline from Iraq. Gaza, Nablus, Rehovot, Petah Tiqva, Beersheba, Nazareth, Tiberias, Acre, are among the towns with populations of less than 30,000—most of them very much less.

Economically, Israel falls into three parts. The coastal plains are the principal home of the citrus groves and vineyards. The hills and plains of Galilee at the northern end of the country are the home of mixed farming. At the southern end the great tract of the Negev, comprising more than half the area of Israel, is a desert upland. Barley, sorghum, wheat, sunflowers, and vegetables are grown. Israel's industries include basic chemicals, plastics, tools and precision instruments, motor cars (assembly), paper, textiles, and electrical goods.

The country's physical structure is simple. On the west is the low maritime plain, rich, fertile, and populous, as it has been for thousands of years. In the centre is the mountain region of Judea, land of hill farms and grazing-grounds. Then comes the valley of the Jordan, the commencement of the great rift valley which extends southwards through the Red Sea to Lake Nyasa in Central Africa.

When it rises near Banias, the Jordan is 3,000 ft. above sea level. When it enters Lake Hula (the Waters of Merom) it is a mere 229 ft. above sea level. Between Lake Hula and the Lake of Galilee (Sea of Tiberias) it drops 915 feet in 11 miles, and between Tiberias and the Dead Sea another 591 ft.

The Dead Sea is 1,286 ft. below sea level—the lowest sheet of water on the earth's crust—and 1,300 ft. is its greatest depth. One of the names given to it in the Bible is the Salt Sea; it is indeed so impregnated with salts that fish cannot live in it and bathers would find it difficult to sink. The salts are valuable commercially, as also are the petroleum and bitumen exudations around the sea's southern end (in Jordan).

Jordan and Cyprus

Adjoining Israel on the east is the Hashemite kingdom of the Jordan. The estimated population is 1.3 million (including 367,000 refugees from Israel), the large majority being Arab Muslims, almost all engaged in agriculture and pastoral activities. Amman (est. pop. 170,000) is the capital, the seat of the Amir. Phosphate and potash deposits in the Dead Sea area are developed. Most of the country is desert, inhabited only by wandering tribes.

Forty miles from the coast of Asia Minor and 60 from that of Syria, the island of Cyprus (area 3,572 square miles; civilian pop. about 497,000) has been a British colony since 1914, in British occupation from 1878. Nicosia is the capital (pop. 39,000); other towns are Limasol, Larnaca, and Famagusta. The products are of the usual Mediterranean type. Its strategic importance to Britain has greatly increased since the British left Egypt.

LESSON 18

The Middle East: Iraq to Afghanistan

Between the Caucasus and the Caspian Sea on the west and the "Roof of the World" (the Pamirs and Hindu Kush) on the east stretches a high mass of connecting folded mountains. This mass bounds the area for a thousand miles; the high ground widens southwards as Persia (Iran) and Afghanistan. Here is a plateau where it is said that the only shade from a tropical outdoor sun is the occasional telegraph pole.

The plateau folk are marauders by instinct in the neighbouring fertile areas. Their land has no value to the world except for its minerals; oil accounts for the world's interests in Persia (Iran) and in Iraq.

The Persian Gulf terminates, as does the Adriatic Sea, in a coastline where the débris of the Tigris-Euphrates floods and the deeper seas compete for settlement. North-west, up the valleys of these streams, is a flood plain

which challenges comparison with Lombardy and with the Indo-Gangetic plain farther east.

Freed from Turkish rule in 1918, and recognized as an independent state in 1932 (following the termination of the mandate granted to Britain by the League of Nations), Iraq has a history stretching back into the immemorial past. It is the Mesopotamia of the Bible the valleys of the rivers Euphrates and Tigris, with a great area of more or less desert on either side.

THE MIDDLE EAST, consisting chiefly of Iraq, Arabia, and Persia.

During winter and spring there is a not inconsiderable rainfall in the north—Mosul, the centre of a rich oil-producing area, has over 16 inches of rain per annum—but between Baghdad, the capital, and the Persian Gulf there falls only a matter of 6 or 7 inches (as a general rule).

The most important agricultural area is in the north, where wheat and barley are grown and there is plenty of good grazing for cattle. Mountain streams are used in the raising of cotton, rice, and fruit. In the delta above the Gulf much of the area is marshy, as a result of the annual floods.

Centuries ago this was one great garden, but political misrule led to the breaking down of the huge irrigation systems on which its prosperity was based. After the ejection of the Turks new irrigation works were undertaken—the Kut barrage was completed in 1939. Where irrigation canals and pumps are in operation the soil produces rice, barley, wheat, cotton, and dates. The last-named flourish especially on the tide-swept banks of the Shatt-al-Arab, and the bulk of the dates entering the world's markets are exported from Basra.

Basra, at the head of the Shatt-al-Arab, is the chief port, population about 206,000. Baghdad, city of *The Arabian Nights' Entertainment*, has some 552,000 people. Mosul, near the site of ancient Nineveh, has about 340,000. The country's total population is approximately 5 millions.

All-Important Oil

The chief industry is oil production. There are important oil fields in the Baghdad and Mosul areas east of the Tigris; pipelines convey the oil from Kirkuk to Haditha on the Euphrates, whence one proceeds to Haifa in Israel and two others to Tripoli in Lebanon. Another and larger (30-inch) pipeline, completed in 1952, goes to Banias, in Syria.

There are oilfields west of the Tigris and north of the 33rd parallel and on the Iranian border north-east of Baghdad. The Basra oilfield began operating at the end of 1951. It centres in Zubair and is connected by a 72-mile-long pipeline with Fao, at the mouth of the Shatt-al-Arab. The oil companies in Iraq assign to the government half the profits from the oil produced. The Iraq and Mosul companies guarantee a minimum output of 22 million tons of crude oil a year.

In 1940 a railway link was completed between Baiji, on the Tigris north of Baghdad, and Mosul, which hitherto had been the terminus of the railway that was begun in 1899 as the "Berlin to Baghdad" line, one of the most cherished dreams and schemes of the German empire-builders. Trains run from Uskudar (Scutari) through Ankara, the Turkish capital, to Aleppo in Syria, back into Turkey along the frontier with Syria to Nisibin, across the tip of Syria to Tel Kotchek, on the Iraq border, to Mosul, Baghdad, Basra, and the Persian Gulf.

Beyond the Gulf and the flood plain is Arabia, a peninsula about one-third the size of Europe. This hot desert area is nominally in Asia, separated from the Sahara merely by the rift of the Red Sea. Here arose the great culture of Islam. Present interest in this land mass, nearly 2,000 miles long from Sinai to Oman, is largely centred on its vast oil resources.

Structurally, Arabia is an enormous plateau barren of life, a plateau it is not possible to cultivate. Of its population of perhaps ten millions the majority are Beduin tribesfolk, wanderers from oasis to oasis in search of scanty herbage for their livestock. The rainfall is next to nothing, save in the Yemen and Oman. Life for the most part is of a patriarchal simplicity, but a political awakening in the Arab world was seen in the formation in 1945 of a League of Arab States (Egypt, Iraq, Syria, Lebanon, Jordan, Saudi Arabia, Arab-Palestine, and Yemen).

Kingdoms and States

The kingdom of Saudi Arabia (Hejaz, Nejd, and its dependencies) covers almost the whole of the interior, with a long coastal frontage on the Red Sea. It contains between five and six million people. Mecca, the religious capital, has a population of some 150,000, Riyadh, the administrative capital, about 100,000. Enormous numbers of Muslim pilgrims journey year after year from all parts of the world to holy Mecca, the birthplace of the prophet Mahomet, and to Medina (50,000) where he was buried. Jedda (pop. 100,000) is the seaport of Mecca. Dates and fruits are produced, but exports are negligible.

To a large extent Saudi Arabia depends economically on revenues derived from oil operations. At Abqaiq, Ain Dar, and Damman, near the Persian Gulf coast, are oilfields worked by an Arabian-American company. At Ras Tanura is a refinery for local use, but most of the oil is shipped to Bahrein for refining or by "Tapline" (Trans-Arabian Pipeline), which runs in a north-westerly direction across Saudi Arabia, Jordan, Syria, and Lebanon to the Mediterranean coast at Sidon.

Camels reared by the Beduin are exported to Syria and Egypt, and Arab horses to Bombay. Roads are mostly desert tracks; some are suitable for motor traffic, notably that from Jedda to Mecca, much used by the pilgrims. The Hejaz railway runs from Medina to Damascus and Beirut, but in the 1950s the Saudi Arabian section was not in working order. A railway from Riyadh to Ras Tanura on the Persian Gulf via Dhahran and the oilfields was completed in 1951.

Yemen is a kingdom in the south-west corner of the peninsula—the most fertile part; the rains are sufficient for wheat, barley, oats, etc., to be grown. The local coffee is famous. San'a (pop. about 25,000) is the capital, Hodeida (about 30,000) the chief port. The total population is approximately 4½ millions.

Muscat and Oman is another independent state, in the south-eastern corner. The coastal strip is fertile and populous, but inland most of the territory comprised within the sultanate is desert. Muscat, the capital, has a population of about 5,000; the adjacent town of Matrah, more important commercially, has approximately twice that number. Altogether, the sultan's subjects number some 750,000. In the valleys and on the coast north-west of Muscat—the Batineh plain—dates of excellent quality are grown. Camel rearing is an activity of the tribes inland.

Kuwait and Bahrein

Adjoining to the north are the territories of the Trucial Sheikhs, considerable areas, largely barren and sparsely peopled, ruled by native sheikhs in treaty relationship with Britain. Yet another independent principality is the sheikhdom of Kuwait, at the head of the Persian Gulf.

Kuwait has a remarkable modern history. Until a few years ago it was typical of the smaller Arabian states, mainly desert with an extensive harbour on which stood the capital. Now it is one of the chief sources of oil supply in the Middle East. Production for export did not start until the middle of 1946, but by 1953 it was over 37 million tons per annum and increasing rapidly. A pipeline connects the Burgan oilfield to the port of Mina at Ahmadi. Revenue from the oil operations is given over to social developments for the population of 205,000.

The state of Bahrein, consisting of a group of small islands in the Gulf, is ruled by an Arab house under British protection. From antiquity it has been the scene of an important pearl-diving industry, and pearls of fine quality are the chief export. Manamah, the capital, is linked by a swing bridge with Muharraq on the adjoining island. Oil was discovered in Bahrein in 1932; the refinery there is the fifth largest in the world. The total population is about 110,000.

Aden and Persia

Aden, long a coaling station and now a great oil bunkering station on the route to India via the Suez Canal, is one of the most important links in the chain of British possessions. The colony has an area of 75 square miles and a population of about 80,516, but the Aden Protectorate extends over 112,000 square miles, with perhaps 650,000 people, chiefly nomad Arabs. Fishing, salt, soap, and cigarette manufacture are among the chief industries.

Persia, known also as Iran, is for the most part a dry and barren tableland encircled by mountains and containing large desert areas. The climate is one of extremes, with slight rainfall—facts which have militated against agricultural development. There is only one navigable river, the Karun, running into the head of the Persian Gulf. The estimated population is 18 millions, of which several millions are nomads.

Teheran is the capital (estimated population 1,000,000). Tabriz (pop. 272,000) is one of the chief centres of the carpet industry. Other towns are Hamadan, Sultanabad, and Kermanshah. There are cotton-spinning mills and smaller industries. Rice and maize are grown in the Caspian lowlands, and almost everywhere there is abundance of fruit. Persia is rich in oil deposits. One of the largest oil refineries in the world is at Abadan.

One of the most backward countries for many centuries, Persia was given a new lease of life by Riza Shah Pahlevi, an ex-trooper who seated himself on the throne of the shahs in 1925 and ruled with a firm hand until 1941, when he fell foul of the Allies in the Second World War and was forced to make way for his more amenable son. One of the most permanent results of his rule was the vast improvement in communications, both by road and by rail.

In 1938 the Trans-Persian Railway was officially inaugurated by the shah. It runs from Bandar Shah on the Caspian, through Teheran and Sultanabad to Bandar Shapur on the Persian Gulf, a distance of 872 miles. Political suspicions of his neighbours, Russia and the then British India, induced the shah to plan that his railway should lie far away from their railway systems, but branch lines and extensions have since been completed.

Afghanistan

The completely inland state of Afghanistan represents the eastern extension of the Persian plateau. The summers are hot and dry, the winters cold with frequent snows. The chief rains fall in spring. Irrigation is necessary for most crops, which include cereals and rice, sub-tropical fruits, cotton, and tobacco. Silk goods are woven at Herat and Kandahar. Herat is also a centre of the carpet industry. Most of the people are husbandmen or pastoralists. Large numbers of cattle, sheep—the fat-tailed variety, grown for meat and for butter made from their tails—horses, camels, and goats are reared.

Kabul is the capital (pop. 200,000), and its manufactures include matches, leather, boots, and furniture. Kandahar (77,000) has some factory industries. Herat (75,000) and Mazar-i-Sharif (42,000) are the next towns in size. The Afghans number altogether about 12 millions. There are some good roads, but there are neither railways nor navigable rivers.

LESSON 19

India, Pakistan, Burma, and Ceylon

THE Indian sub-continent is a peninsula pendant to Asia. The mountain wall of the Himalayas, which severs the land from the rest of Asia, is sufficiently high (5½ miles at its maximum) throughout its thousand miles of length to hinder and almost prevent the movement of peoples and animals and plants across it, and to cut off from north and east and west those lower levels of atmosphere which are the prime control of weather and climate. A blanket of moist air, visible as fog or cloud or rain, or invisible yet always present, prevents this vast area from being an Arabia.

This blanket is subject to periodic disturbances, which result in the monsoon downpours. The blanket itself is not continuously of the same character, for in the north-west, over the desert of Thar and Rajputana, the water-content of the air is small; in the north-east, in the lower valley of the Brahmaputra, the moisture in the atmosphere is at a maximum for the world. Looked at from above and from without, the air over India is an eddy swirling within a cul-de-sac, limited on three sides by the high land, open at sea level to the ocean, the Equator, and conditions from the southern seas.

Teeming Millions

Physically, the sub-continent is a trinity. The Deccan, the southern peninsula, is a tableland of old rock, scarp-fringed to the seas, an area with a relatively smooth coastline where the people have not become seafarers (as is usual in Europe, where the Norwegians and the Greeks are characteristic maritime peninsular people). The mountains and the mountain forelands are an abrupt wall of up-folded younger rocks, which form a massive barrier.

Between these two distinct areas lies the Indo-Gangetic plain, a débris-filled trough—stoneless, treeless, sun-parched in the west, sodden in the east where rivers wind almost at will, and annually visited by the monsoon rain-clouds which deposit their water-burden promiscuously, with famine and pestilence in the populated tracts which they temporarily miss.

When the British withdrew from India in 1947, two separate states were set up, primarily

on a religious basis. The Republic or Union of India is primarily Hindu, the Republic of Pakistan is essentially Muslim. At that time India had an estimated population of 337 million people and an area of 1·22 million square miles, Pakistan 71 million people on 361,000 square miles. The respective populations at the census of 1951 were 356·9 million in India, 75·8 million in Pakistan, a total of about 433 million (excluding Jammu and Kashmir, Gilgit and Baltistan, Junagadh and Manavadr).

Pakistan is in two parts, separated by a thousand miles of Indian territory. Eastern Pakistan comprises much of the delta of the Ganges-Brahmaputra (rice and jute-growing land), some two-thirds of the former province of Bengal, together with adjoining land formerly in Assam. Western Pakistan comprises half the former province of the Punjab (now West Punjab, with Lahore as the chief town), the North-West Frontier Province, Sind, and Baluchistan.

The Union of India embraces the remainder (except the disputed territory of Kashmir) and the old distinction between "British India" and "Indian India" (or native states) has disappeared.

For the most part the teeming millions of India and Pakistan live in small villages, of which there are well over half a million. But the trend is towards urban concentrations. Calcutta is the largest city; with Howrah and suburbs it has some 3,599,000 people. Bombay comes next, with 2,839,000. These great seaports are in the Indian union. Karachi is the capital of Pakistan, with a population of 1,126,000.

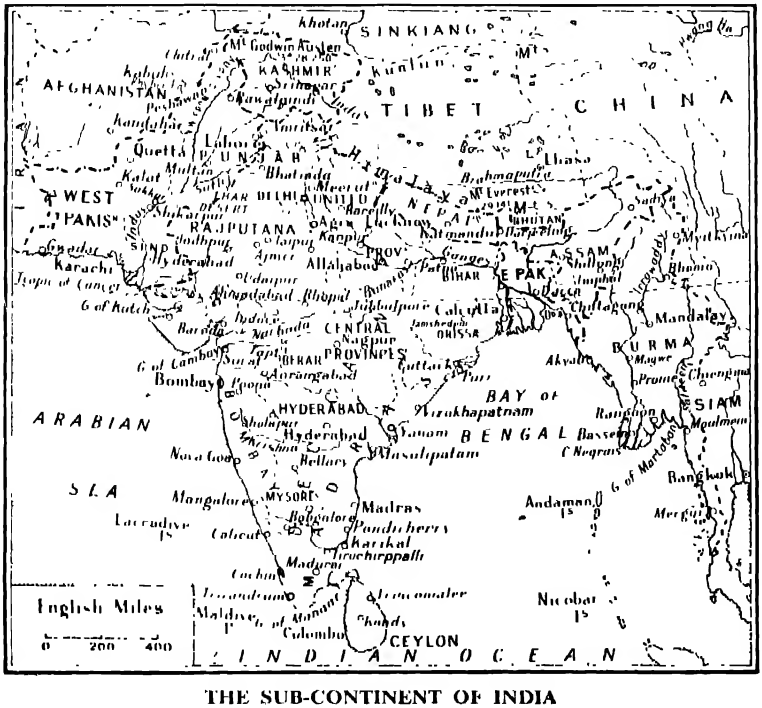
Between them these ports handle the foreign sea-borne commerce of India and Pakistan, though since partition Chittagong has increased greatly in importance as the ocean port of Eastern Pakistan. Other important cities and towns are Delhi, the political capital of India (915,000), Ahmedabad (788,000), Hyderabad (739,000), Lucknow (499,000), Poona (491,000) in India; and Lahore (849,000) in Western Pakistan.

Monsoon the Dominant Factor

As from time immemorial, agriculture—primitive husbandry of a hand-to-mouth kind, with the minimum of capital equipment and complete reliance on human sweat and toil—is the occupation of the great mass of the people of India and Pakistan. The dominant factor is the monsoon, and the farmer's year is naturally divided into the *kharif* season of the monsoon and the *rabi* season of the dry, cold weather.

The greater parts of the Indo-Gangetic plain and the northern tracts of the peninsula have their rains from the south-west monsoon in June to October, in the south the bulk of the rainfall comes from the north-east monsoon, which blows from October to February. On the west coast and throughout the south, conditions are more truly tropical and the dividing line between the two seasons kharif and rabi tends to disappear.

In South India rice and millets are the chief food crops. In the northern parts rice, millets, maize, pulses, and oil-seeds are the principal food crops in the monsoon season, with cotton, jute, and ground-nuts as cash crops. Sugar-cane is grown throughout the year in all parts save the extreme north. Vast numbers of cattle are kept by the peasantry, but in India the reverence in which they are held by the Hindus



THE SUB-CONTINENT OF INDIA

militates against scientific stock-rearing and animal husbandry generally.

The great alluvial plains of the north—those of the Indus and the Ganges—are among the richest of the world's soils, and (given water) are exceedingly fertile and easy to work; hence the enormous populations which they have supported from the earliest times. Irrigation is necessary because there are occasions when the rains do not fall or fall only in too limited measure.

Irrigation

Dams and irrigation schemes built by British administrations and engineering firms are among the finest monuments to British rule in the Orient. The Cauvery-Mettur irrigation system in Madras, inaugurated in 1934, is held to be the biggest in the British Commonwealth. The Sukkur, or Lloyd, dam across the Indus has created out of desert sand an area of fertile land larger than the whole of cultivated Egypt.

The Madras and Bombay states and Sind province can boast of some of the most spectacular and strikingly successful irrigation schemes in the world. In Central and South India tank irrigation is common. Another big scheme, begun in 1945, was the Damodar valley project to irrigate 750,000 acres from Bihar to the Hoogly near Calcutta. In 1947, when the countries became independent, there were 57,400 square miles irrigated in India and 31,700 square miles in Pakistan, totalling 57 million acres.

Crops and Industries

East Pakistan holds a virtual monopoly of the production of raw jute, and the fibre is exported to all parts of the world. Both Pakistan and India have jute processing factories. Tobacco is grown here and there all over the country, chiefly in the stretch from Bombay to Burma. Wheat is grown, particularly in the areas fertilized by the Lloyd barrage and brought into being by the Punjab irrigation schemes. Tea is a staple crop in Assam and Bengal.

India has been the home of the cotton trade from the earliest times. In the Bombay factories work can be carried on all the year round without artificial light, short hours of daylight in winter not being present as in higher latitudes.

In the northern provinces sericulture has been long practised, but the competition of artificial silk is considerable. One of the most important industries associated with Indian agriculture is that of tea, and since about 1930 there has been a rapid growth of sugar factories. Shawl- and carpet-weaving, woodcarving, pottery, and metal-working are other industries in which Indian and Pakistan craftsmen excel.

About 342,000 people produced over 36 million tons of coal in India in 1952. Pakistan has no coalfields. The principal coalfields are in Bengal, Bihar, and Orissa; others are in Hyderabad and Madhya Pradesh (formerly the Central Provinces). The Bengal Iron and Steel Co. operates the Barakar Ironworks, getting the ore from the "Singhbhum iron belt." The Tata Iron and Steel Co. at Sakchi obtains its ore from deposits in Mayurbhanj. The Indian Union is now the second largest producer of iron in the British Commonwealth, exceeded only by the United Kingdom.

The Tata company is India's greatest industrial concern. Its plant at Jamshedpur is bigger than anything at Sheffield; it is the largest plant of its kind in the Commonwealth. The Tatas are Parsees, one of the smallest but most progressive and enlightened of Indian religious and racial communities. The controlling company is Tata and Sons, Ltd. of Bombay, and associated with the group are hydro-electric companies, which supply electric power for the Bombay area, cotton mills in Bombay (reported to be models of their kind), and collieries, cement factories, construction and building companies, and other concerns.

Ceylon

Ceylon, an insular appendage to the Indian peninsula, has an area of 25,332 square miles. The interior is a mountainous plateau. Along the coast and in the north are lowland plains, closely cultivated. The principal food crop grown by the natives is rice, but the agricultural wealth of the island is in its tea plantations on the mountain slopes of the south-west. On the lower slopes of the hills are many rubber plantations.

The population of some 8,103,000 consists of Sinhalese, Tamils, Moors, Burghers, Eurasians, Malays, and primitive Veddahs. Colombo, the capital (pop. 425,000), is one of the greatest ports of the Orient and a vital link in British communications. Politically, Ceylon is an independent state of the British Commonwealth.

Burma

Burma, which was long one of the "Governor's Provinces" of the Indian Empire, was separated from India in 1937 and launched along the path that should normally lead to the status of a self-governing dominion. The country was invaded by the Japanese in December 1941 and occupied by them until 1945.

By friendly agreement and a treaty signed in London, Burma (under the title of the Union of Burma) became an independent republic, outside the Commonwealth, in 1948. But armed strife between different racial groups and the spread of bands of robbers hindered economic progress. Some 254,000 square miles in area, Burma had a population of 17½–18 million in

1953, including many Shans (in and near the Shan States), Chins, Kachins, and Chinese.

The mountains are covered with forests, and much of the interior was virtually unexplored jungle until the Second World War. Upper Burma is mostly undeveloped. Rice is grown in parts, and the forests yield teak. There are oilfields in the Irrawaddy valley, those at Singu and Yenangyaung being the most important. The oil is normally sent to Rangoon for refining. In the deltaic regions flooding caused by the rivers makes rice cultivation easy. Rice-mills at Rangoon, Moulmein, Bassein, etc., prepare it for export to India. Tin is mined in the Tenasserim area. Rangoon, the capital, had a population in 1951 of some 700,000 ; Mandalay came next with 182,000, and then Moulmein with 99,000.

LESSON 20

South-East Asia: Malaya to the Philippines

THE general trend of South-East Asia is towards the southern hemisphere and the eastern side of Australia. From the eastern end of the east-west fold of world mountains the Alps-Himalayas, roughly parallel ridges stretch southwards ; between them are the valleys of the Salween and the Mekong. Here is a section of the world which has been only partially explored.

Immediately south of the Tropic of Cancer the Shan states of Burma and the western confines of Chinese Yunnan meet and the mountainous backbone of the Malay peninsula extends southward again. This is on the west ; on the east a similar ridge through Annam forms a smaller backbone for Indo-China.

This ridge terminates at 10° N., at the South China Sea ; the other ends at Singapore, almost on the Equator. Between the ridges lies Siam (Thailand), comprised of alluvial flats across which meander the Menam and the Mekong rivers.

Beyond the peninsula, as a continuation, lies Indonesia, in a double line: first : Sumatra, Java, and Timor ; second : Borneo, Celebes, and New Guinea. Lying off Borneo to the north are the Philippines. Most of the land surface is elevated. Java is entirely upland. Sumatra has an eastern coastal plain. The shapes of Celebes and the Philippines are an index of the lack of lowland. Most of the sea surface covers deep waters.

Singapore is more than 1,100 miles from Rangoon, 800 miles from Bangkok, 640 miles from Saigon, 1,340 miles from Manila, 1,550 miles from Colombo. The whole area is one of great heat and copious rains, either as a semi-monsoon or as constant tropical outpourings, and the vegetation is that of the hot, wet forest.

Malay Peninsula

The Malay peninsula begins as a continuation of Burma and Siam, running side by side, as it were, until they come to the Kra isthmus, where Burma ends. Three hundred miles or so further on is the Federation of Malaya. It is a British dependency consisting of nine states together with the two west coast settlements of Malacca and the island of Penang. Formed in 1948, the Federation has witnessed developments in spite of continual outrages by terrorist bands and counter-measures of suppression. A complicating factor is the mixed character of population; out of a population of 5¼ millions (1950) there are over 2,000,000 Chinese, over 500,000 Indians and Pakistanis, and over 700,000 others, including Europeans.

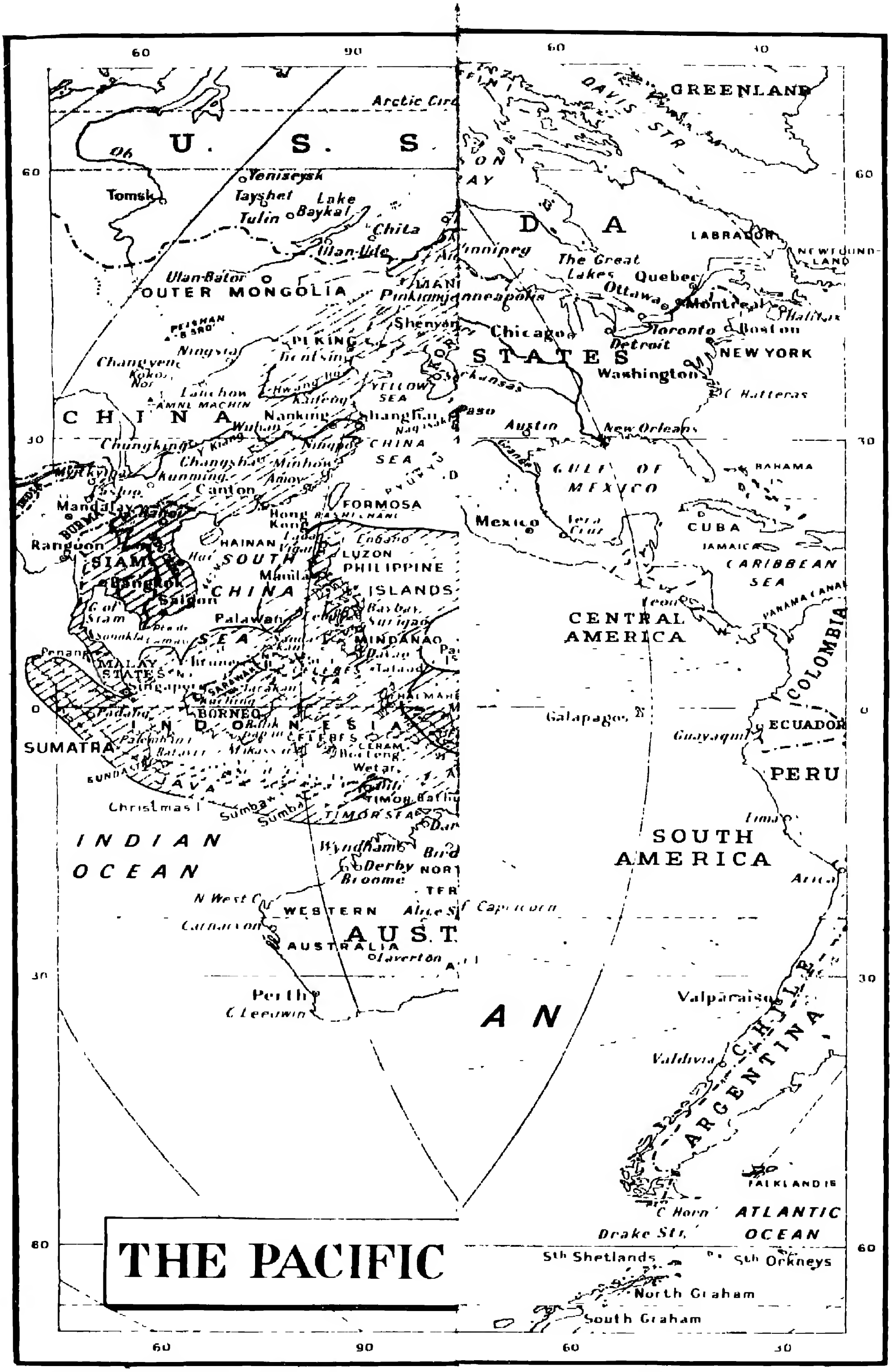
Off the southern end of the Malay peninsula and separated from the mainland by a strait only ¾-mile wide is the island of Singapore. This island of 220 square miles is a British colony supporting a population of over a million, of whom nearly four-fifths are Chinese. Singapore's fame rests on the strategic and commercial importance of its position—"the Clapham Junction of the Orient."

Associated with the colony of Singapore is Christmas Island, a dependency about 220 miles south of the western end of Java. Long incorporated in the colony of Singapore, the Cocos and Keeling coral islands, in the middle of the Indian Ocean, were transferred to Australia in 1952 for use as a stopping-point on the air route between Australia and South Africa.

Republic of Indonesia

Indonesia has the major part of the great island of Borneo ; but the north and north-western parts, forming between a fourth and a third of the whole, come within the British sphere. Here are (1) the colony of North Borneo (including Labuan, formerly part of the Straits Settlements of Malaya), (2) the colony of Sarawak, and (3) the protected state of Brunei, lying between the other two.

Indonesia links Malaya with Australasia. It consists of four large islands—Java, Sumatra, Borneo, Celebes—and a large number of other islands. The total area is about 600,000 square miles, with a population of approximately 75


THE PACIFIC
U. S. S.
Arctic Circle
GREENLAND
DAVIS STR
Tomsk
Yeniseysk
Tayshet
Lake Baykal
Tulin
Chita
Ulan-Ude
Ulan-Bator
OUTER MONGOLIA
Winnipeg
D A
LABRADOR
NEWFOUNDLAND
The Great Lakes
Quebec
Ottawa
Montreal
Halifax
Toronto
Boston
Detroit
Chicago
NEW YORK
Washington
STATES
Shenyang
PEKING
Tientsin
Lanchow
Nanking
Shanghai
YELLOW SEA
C Hatteras
C H I N A
Chungking
Wuhan
Changsha
Kunming
Canton
Amoy
CHINA SEA
FORMOSA
Austin
New Orleans
GULF OF MEXICO
BAHAMA
Mandalay
Hanoi
Hong Kong
HAINAN
Rangoon
SIAM
Bangkok
Saigon
SOUTH CHINA SEA
Manila
LUZON
PHILIPPINE ISLANDS
Palawan
MINDANAO
Mexico
Vera Cruz
CUBA
JAMAICA
CARIBBEAN SEA
CENTRAL AMERICA
PANAMA CANAL
COLOMBIA
Penang
MALAY STATES
Singapore
BORNEO
SARAWAK
I N D O N E S I A
CELEBES
CERAM
SUMATRA
JAVA
Galapagos
ECUADOR
Guayaquil
PERU
Christmas I
Sumba
TIMOR SEA
INDIAN OCEAN
Wyndham
Derby
Broome
Lima
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Carnarvon
WESTERN AUSTRALIA
AUST.
Laverton
C Capricorn
Perth
C Leeuwin
A N
Valparaiso
CHILE
ARGENTINA
Valdivia
FALKLAND IS
C Horn
ATLANTIC OCEAN
Drake Str.
Sth Shetlands
Sth Orkneys
North Graham
South Graham

millions. The capital is Djakarta (Batavia), in Java, and the population over 250,000.

Siam (Thailand) is nominally an independent kingdom, of some 200,000 square miles and a population of approximately 18 millions. Bangkok, the capital, is sometimes called the Venice of the East. With a population of over 1,000,000, it is the only really large city in Siam.

As a result of the Second World War, Indo-China, formerly part of France's colonial empire, was reconstituted as three independent states associated with France in the French Union. Cambodia and Laos became sovereign states with constitutional monarchies. Cochin-China, Annam, and Tongking, combined in the republic of Viet Nam, are now known respectively as South, Central, and North Viet-Nam. Saigon is the seat of the central government; together with neighbouring Cholon it has a population of over 250,000. Phnom-Penh, the capital of Cambodia, has 250,000. Haiphong, the chief port in the north, and Hanoi, capital of Viet Nam, each have a population of approximately 150,000.

The islands that make up the republic of the Philippines were ceded to the U.S.A. by Spain after her defeat in the war of 1898; granted provisional independence in 1935; occupied by Japan during the Second World War; and accorded by the U.S.A. full independence as a republic in 1946, with reciprocal trade privileges. In 1947 the U.S.A. leased numerous defence bases in the Philippines.

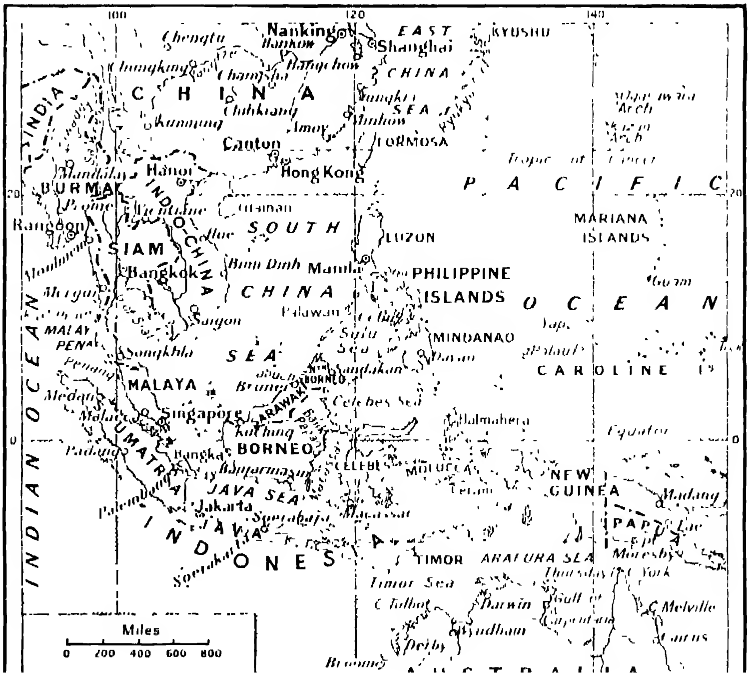
There are 7,083 islands and islets in the Philippines group, but only 462 exceed a square mile. Luzon, on which is Manila, the capital, is the largest and most important; next come Mindanao, Samar, Negros, Palawan, Panay, Mindoro, Leyte, Cebu, Bohol, and Masbate. Some 19 millions of people are congregated in a total area of 115,000 square miles. Manila had a population in 1948 of 1,180,000.

The whole of this vast area is one of tropical abundance. Even so, the native people have a low standard of existence; rice is the staple food of millions. Rain falls in most parts throughout the year, and forests clothe the mountain slopes.

Java, in Indonesia, is the island of greatest importance economically. There are two main types of agriculture: that of the native cultivator, usually on a holding of less than two acres, with rice and other foods for home consumption as the crops; and that of the estate company with plantations of a thousand acres and more, worked often under European direction and producing coffee, sugar, tea, rubber, tobacco, cacao, tapioca, pepper and other spices, and cinchona (the raw material of quinine).

Sumatra has much the same products, though on a rather smaller scale; its mineral wealth perhaps surpasses that of Java. Coal is mined, and oilfields are in production at Palembang. Semarang in Java and Balik Papan in Borneo are other important oil-producing centres. The Moluccas are famed for their spices.

In the Philippines only a small proportion of the total area is under cultivation, and the great majority of the farms are plots of three acres or less, on which the Filipinos raise rice and other food crops. Copra and coconut oil are among the principal exports, and Manila hemp is almost the islands' monopoly.



SOUTH-EAST ASIA, comprising the Malaya peninsula, Indonesia (linking Malaya with Australasia), Siam (Thailand), Indo-China, and the Philippine Islands.

Malaya is famed for tin and rubber. The rise of rubber to a position of immense economic importance dates from about the time of the First World War, and from the beginning Malaya occupied a high place in the list of producing areas. In what was then called the Federated Malay States there were, before the Japanese invasion, over 1,700,000 acres given over to rubber plantations, and the taxation on the profits provided the backbone for the finances of the colony. In almost all the islands of Indonesia rubber is a principal crop, and there are also several large plantations in the southern islands of the Philippine archipelago.

The economy of Siam (Thailand) is based on rice, but attempts have been made at cotton-growing; and in the vicinity of towns there are market-gardens tilled by Chinese immigrants. In the south and east there are rubber plantations, and in the dense forests of the north teak cutting is an important industry.

LESSON 21

China and Outer China

BECAUSE of its size and population China must be compared statistically with the whole of Europe. Estimates vary considerably, but China's total area is over 3,750,000 square miles and in 1950 the estimated population was 484 millions. China proper—the ancient China protected by the Great Wall—contains 18 provinces. The whole of China, within the limits now generally recognized, has 14 more.

Five provinces have been set up in Manchuria (called Manchukuo by the Japanese), with which is also associated the province of Jehol formerly regarded as part of Inner Mongolia. The latter region has been constituted an autonomous territory, comprising three more provinces. Another province is Sinkiang (Chinese Turkistan). Eastern (Chinese) Tibet, which claimed to be independent, or at least autonomous, came under Chinese control in 1951. If Formosa be added, the number of provinces is brought up to 32.

As might be expected from China's vastness there are great differences in the physical aspect of the country, in its weather and climate, in its people, and in the nature of its agricultural produce and its economic resources. The greater part of China lies outside the tropics, but within the area of monsoon rains. The summers are everywhere hot; the winters are cold in the north, warm in the south. These differences in temperature are reflected in the racial contrast between the hardy peasants of the north and the easier-going folk of the rice-bearing lowlands.

Three Great River Basins

From the beginning of history, and long before, the Chinese river valleys have been the scene of a busy civilization; but always the fecundity of the people has been kept in check by famine and flood, by pestilence, and, as often as not, by the misgovernment of man. For thousands of years China had been an ordered state: in 1912 the republic supplanted what was then the world's oldest monarchy (with the possible exception of Japan).

But the immensity of the country and the difficulties of communication, added to the prevailing illiteracy (due in large measure to an exceedingly difficult script), militated against national unity. After the Japanese invasion in 1937 a united China, free and independent arose under Chiang Kai-shek, but this fell a victim to circumstances. The Communist party gained control in 1949 and proclaimed the People's Republic of China, with Peking as capital. The government of Chiang Kai-shek took refuge in Formosa, where it survived (1956) by goodwill of the U.S.A.

Three great river basins make up the larger part of China. First is that of the Hwang-ho, or Yellow River, some 2,600 miles in length; it rises in the Kwen Lun mountains to the north-east of Tibet. It flowed into the Gulf of Chihli until 1938 when the Chinese, as a defence measure against the Japanese, diverted it at Kaifeng to enter the Yellow Sea. Operations to redivert it to its original course were commenced in 1946.

Crops, Minerals, Manufactures

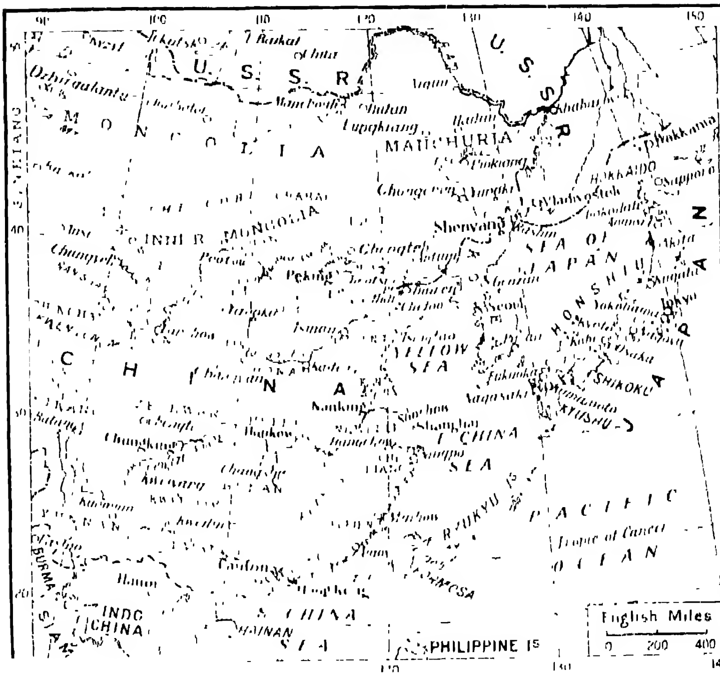
The mountainous parts of the provinces of Kansu, Shensi, Shansi, and Honan are covered with large deposits of loess—yellow-brown earth, supposed to be dust resulting from prolonged denudation of the rocks of Central Asia and carried eastwards by winds. Loess also covers the great alluvial plain that surrounds the river's lower course. Immensely fertile, the loess permits an intense cultivation, but in parts the natural water-supply has to be supplemented by irrigation.

The staple food crops of the region are wheat, millet, peas, and beans. The mineral resources of Shansi in particular are tremendous, and its iron ore, occurring close to abundant coal supplies, has been the foundation of an industry which ranks as perhaps the oldest in the world. Unfortunately the mode of occurrence of the

iron deposits in Shansi is not favourable to the development of a large industry of the modern type. In Hopei are some of the country's most important coal mines. Shantung is also a great coal-producing area.

So rapid is the Hwang-ho's flow, and so strewn with shallows is its lower stretch, that the river has little value as a waterway. No great commercial city has grown up at its mouth. Tientsin (pop. 1,795,000), on the Pei-ho, is the port of Peking (pop. 2,031,000) and the trading centre for the whole Hwang-ho basin. Chefoo and Tsingtao are important ports on the sea coast.

Largest and most important of China's natural divisions, the basin of the Yangtse-Kiang consists of a series of steps descending from the mountains of Tibet. Throughout the whole basin two crops a year are generally possible, whereas in the basin of the Hwang-ho only one is possible. Rice is extensively grown, and in places sugar-cane and tea flourish.



CHINA AND JAPAN, sketch map of China, showing also Mongolia, parts of Indo-China and the U.S.S.R., and the islands of Japan

The summers are longer than in the north, the winters are warmer, and the rainfall heavier — all factors making for a sub-tropical variety in vegetation. China ranks among the world's greatest producers of raw cotton; this is grown in enormous quantities in both the Yangtse and Hwang-ho valleys. Cotton and silk goods are among the chief manufactures. Coal and iron deposits are extensive. There are oilfields in Shensi and the Upper Yangtse valley.

Where the Han joins the Yangtse is the triple town of Hankow-Hanyang-Wuchang (pop. 800,000), a commercial centre and manufacturing city of the first importance. Here are Chinese iron and steel works, and engineering works; ore is obtained from Tayeh, some 60 miles away.

Unlike the Hwang-ho, the Yangtse is an important channel of communication, navigable for much of its length. At its mouth stands Shanghai (5,407,000), metropolis of commerce and finance in China. A hundred miles or so inland is Nanking, with a population of 1,020,000. A thousand miles up country is Chungking (pop. 1,110,000).

All this western part of the Yangtse valley had been, as it were, the Chinese backwoods until the coming of the Japanese. Then some light industries and skilled technicians and administrators retreated westwards before the invaders, and Szechwan and the adjoining provinces, even remote Yunnan (opened up by the Burma Road), were given a new prosperity.

Yunnan with the provinces of Kweichow, Kwangsi, and Kwantung may be said to form another natural unit. Mountains predominate throughout, sloping downwards to the sea. Wheat, barley, and beans are cultivated in the uplands, rice in the lowlands. Yunnan tea is famous. Cotton and silk goods are produced. Tin ore is plentiful in Yunnan, and tin is exported. Coal and iron are worked.

Roads, Rails, Waterways

Canton (pop. 1,490,000), near the Sikiang's mouth, is a big port and commercial centre. Off the coast is the island of Hong Kong, for long one of Britain's richest overseas possessions; the colony suffered in many ways from the Japanese conquest and occupation in the Second World War, but after its liberation it again became one of the great *entrepôts* of world trade. Its population exceeds two million.

Roads and waterways cover parts of China with a network of communications. The Sino-

Japanese war brought about the construction of new highways linking China with the world to the west the Burma road, running from Lashio in Burma to Kunming in Yunnan, and the Sinkiang road, linking Szechwan with Sinkiang and on to the Turk-Sib. railway. The Sinkiang road had a planned length of 2,500 miles.

China proper has approximately 10,000 miles of railway. The most important is the line from Mukden to Peking and thence to Canton, nearly 2,400 miles. A railway from Yunnan into Burma was opened in 1940 before the Japanese occupation of the latter country.

Manchuria

The six north-eastern provinces which constitute the district called Manchuria lie roughly between Inner Mongolia, the Amur, and Korea. The district's area is about 826,000 square miles and its population 40 millions. Mukden (1,550,000), Harbin (638,000), and Hsinking (420,000) are the most populous cities.

Primarily an agricultural country, Manchuria produces large quantities of soya beans, wheat, and millet. Its mineral production is important. Near Mukden are the Fushun coal-mines, and between Mukden and Dairen are the Anshan ironfields, the basis of a large steel-producing plant. The Japanese had expended much capital and effort in the development of the country's economic resources, but the climate was too cold and forbidding for the Japanese settler. Chinese from the congested areas of the Hwang-ho basin found it congenial enough, and on their labour Manchuria's prosperity was founded.

Roads are few and poor, but Manchuria's railways are highly important. The Chinese Eastern railway, the original final section of the original Russian-built Trans-Siberian, runs across the country from Manchouli to Harbin, whence one line proceeds to Vladivostok, in Russian territory, another through Hsinking to Mukden and Port Arthur. From Hsinking (formerly Changchun) the line is called the South Manchuria railway. The North China railway links Mukden with Tientsin. The Chinese Eastern and South Manchurian railways were unified under joint Russo-Chinese control for 30 years, under a treaty of 1945.

Tibet ; Sinkiang ; Mongolia

The little-known country of Tibet has an area of 463,000 square miles and a population estimated at three million. One fifth of the males are monks. Lhasa, once the "forbidden city," has about 50,000 inhabitants. The hardier cereals, vegetables, and fruit are grown, but the chief interest of the people lies in their flocks and herds.

There may be considerable mineral wealth in the mountains, and gold has long been worked. Tibet's trade is with India and Pakistan across the Himalayas, and with China across the mountains of Chinghai and Sikang.

Sinkiang is the name given to all the area between Mongolia on the north and Tibet on the south, i.e. the districts of Chinese Turkistan, Kulja, and Kashgaria In the basin of the Tarim cereals are grown along the banks of the streams, which are fed by the snows from mighty ranges round about The Kirghiz nomads raise horses, camels, sheep, and goats, and in such towns as Kashgar, Khotan, and Yarkand there are important markets. The northern region is far less watered and the soil is poor in the extreme Sinkiang's area is 743,000 square miles, with a population of about 4 million Urumchi is the capital.

Between China and Sinkiang on the south and Soviet Asia on the north is a vast area called Mongolia, area approx 1,875,000 square miles, population 3 5 million, mostly Mongols. The central part is occupied by the Gobi desert; elsewhere there is plenty of grass for cattle.

Outer Mongolia is now called the Mongolian People's Republic. Its complete independence was recognized by China in 1945 and it is now within the Soviet sphere. Ulan Bator (Ulan-Bator-Khoto, "Town of the Red Knight," bespeaking Soviet influence), formerly Urga, is the capital, estimated population 100,000.

LESSON 22

Japan

FOUR large and many small islands form Nippon, as the Japanese style their country. Following a policy of territorial expansion the "Land of the Rising Sun" succeeded in adding to these Korea, Formosa, Karafuto (the southern half of the island of Sakhalin), the Kwantung peninsula (leased from China), the Marianas (or Ladrone), Caroline, and Marshall Islands in the Pacific, originally mandated to Japan by the League of Nations, and the Kuriles linking Hokkaido with the Soviet peninsula Kamchatka.

In 1941-42 Japan seized by force Indo-China, Siam, Burma, Malaya, the Netherlands East Indies, the Solomon Islands, etc., thus adding to conquests made in China following the Sino-Japanese "incident" begun in 1937. But Japan surrendered unconditionally to the Allies in 1945 ; her empire vanished, and she was reduced to her original islands.

Japan proper consists of the four principal islands of Honshu (or mainland), Kyushu, Shikoku, Hokkaido (Yezo), and the mass of adjacent islands. Their total area is 142,270 square miles, with a population (1953) of just over 86 millions.

Extending over some 30 degrees of latitude, the Japanese islands show considerable climatic variations, which are added to by the proximity of the Asiatic land mass and warm and cold ocean currents. On the whole, the winters are warmer and the summers cooler than they are on the opposite coasts of Asia. The heaviest rains are in summer, when Japan lies within the monsoon area.

Mountains and Rivers

All the large islands are mountainous, and among the heights are volcanoes—some, like Fujiyama (12,390 ft.), inactive; but more than 50 are liable to burst into vigorous and devastating life. Earthquakes are frequent, because the islands lie on a marked "fault" in the earth's crust; an earthquake in 1923 wiped out Tokyo and caused enormous loss of life. Another sign of the instability of the earth's crust is seen in the innumerable hot springs with which the countryside is dotted.

Rivers are numerous, providing abundant water for irrigation and power for industries. The longest is the Ishikari (400 miles) in Hokkaido. So much of the country is taken up by mountains and rocky or forest-covered expanses that only some 16 per cent. of the whole area is cultivable. Yet for centuries Japan has supported a very large population

Crops and Industries

The agricultural land consists in part of low-lying fields, formed mostly of alluvium washed down from the hills, in part of uplands, and in part of high plains and pastures. Nearly half the cultivated area is included within the first category—the paddy fields from which sometimes two crops of rice are taken in a year. Barley, oats, wheat, beans, and potatoes are grown on the uplands On the heights there is a considerable amount of stock-rearing and pastoral farming.

Cultivation of the mulberry tree and the rearing of silkworms formed a highly important industry until the competition of artificial silk led to the old industry's decline. Now Japan ranks next to the U.S.A. in the production of artificial silk. Natural silk plays a very reduced part in Japanese exports. Tea is grown, mostly for home consumption. Other commercial crops include cotton, flax, hemp, indigo, and tobacco.

Coal measures are widespread, but the quality is not of the best. The principal coalfields are in Hokkaido, in the north and west of Kyushu; and along the Pacific seaboard in Honshu to the north-east of Tokyo. Petroleum occurs at Akita and Nugata. At Wakamatsu, in Kyushu, are large iron and steel works, based on the adjoining coalfields.

Cities and Ports

Tokyo, the capital, had in 1953 a population of 6,330,146, making it the largest city in the Far East. It was rebuilt on modern lines after the disastrous earthquake of 1923, but much of the new city was destroyed by Allied air attack in the Second World War. Here is the Emperor's palace and the seat of government; the city is also a manufacturing and commercial centre. Osaka, with 1,956,000 people, ranks next after Tokyo; its numerous textile mills make it worthy of the title of the Manchester of Japan.

Nagoya and Kyoto have populations in excess of a million. Kobe, the importing centre of the Osaka area, and Yokohama, are ports with populations just below a million; Yokohama was the market for raw silk, and its exporting centre. All these cities are in Honshu. Nagasaki, another big port, outlet of the coalfields, is in Kyushu; it was almost completely destroyed in the Second World War- by the atomic bomb dropped on August 9, 1945.

Korea and Formosa

From 1910, Korea, or Chosen, to give it its Japanese name, was part of the Japanese empire It is a peninsular extension of Manchuria, with an area of some 85,000 square miles and a population of about 29 millions. After the Second World War two republics, North and South Korea, were established, having the 38° N. parallel as the dividing line.

North Korea is the larger part, with an area of about 49,000 square miles (nearly the size of England), leaving 36,000 square miles for South Korea (rather less than Wales and Scotland combined). In 1950, Seoul, capital of the South, had an estimated population of over 1½ million. Pusan, the chief port, had about 500,000. Heijo (Pyeng-Yuang), the capital of North Korea, had a population of around 300,000. In the Korea War of 1950-53 Seoul was reduced to rubble; after the war Pusan became the largest city.

Most of the people of Korea live on the west side, where the coastal plain is broad and there are numerous fertile valleys. Rice is the staple food. Cotton and soya beans are the chief cash crops. Silkworm rearing is carried on. Iron and coal deposits are abundant. There is also some gold mining. Textiles constitute the principal industries, and there are fertilizer works, cement plants, and potteries. Ports and harbours are numerous and excellent.

The large tropical island of Formosa or Taiwan (14,000 square miles; pop. about 7.6

millions) was taken by the Japanese from China in 1895, and it was proclaimed a new province of the Chinese Republic in 1945. The arable land is very fertile and the chief food crops are rice and sweet potatoes. The southern plains are particularly suitable for sugar-cane, and tea is grown in the north. In the mountainous parts the camphor tree flourishes, and the export of camphor provides the bulk of the world's supply. Coal and the precious metals are mined. The ports are Kurun and Takao.

What was Japanese Sakhalin or Karafuto (annexed from Russia in 1905) had considerable economic possibilities; the Sakhalin oilfields overlapped the Russian portion of the island. Karafuto was re-annexed by Russia in 1945; the Kuriles were allocated to Russia by the Yalta conference of that year. Kwantung owes its importance to Port Arthur, which in 1945 came under joint Sino-Soviet control as a naval base for 30 years. Dairen became a free port for 30 years under the same treaty.

LESSON 23

Soviet Asia

THE northern half of Asia belongs to the Soviets. It starts, as it were, with all the Arctic Ocean frontage of the Asiatic continent and it extends to the Pamirs, to the vast mountain ranges that fringe the north of the Indian sub-continent. It stretches from the Urals on the borderland with Europe to the Pacific over against Japan.

The Arctic Circle, which is 66½° N., encloses the tundra (barren, partially frozen plain, growing moss and lichen), a strip of Northern Asia that is 600 miles wide in parts and rises gradually from shallow seas to the lower heights of the north of Siberia. Along this coast are the north-west and north-east passages. The Asiatic section extends for a third of the way round the world, from 60° E. to 180° E.

South of the Arctic Circle to 45° N., half-way between Pole and Equator, Asia extends inland, slow-climbing across the taiga (coniferous forest with non-black soil) and the grassy steppe (black soil) to the Tien Shan, with its north-eastern extensions, including the Altai. South of these first heights are the basins: in the west, the lowland basin of the Aral and Caspian Seas, of Turkistan; in the middle, the elevated Tarim basin, which has the "Roof of the World" at its south-west corner, and in the east the Gobi, both in Mongolia.

North of the basins are the rivers Lena, Yenisei, and Ob, all exceeding 2,000 miles in length. Into the Sea of Aral flow the Amu-Darya (Oxus) and the Sir-Darya. Lake Baikal fills a highland trough and outflows to the Yenisei; it is one of the largest fresh-water lakes in the world and is frozen over in winter.

Between Lake Balkhash and the European frontier is the Kirghiz steppe, the home of the Kirghiz. Around Tobolsk, on the Irtish, are the Tartars, who extend eastwards through Tomsk to Irkutsk and Yakutsk. Between the Ob and the Yenisei are the Ostyaks; between the Yenisei and the Lena are the Tunguses. Fringing the Arctic are the Samoyeds, the Yakuts, and the Yukagirs. These are the native tribesfolk among whom Slav immigrants and others have made their homes.

The whole of Northern Asia is frost-gripped at sea-level temperatures in January. Northwards the frost is more severe, the zone of maximum cold, with 60 or more degrees of frost in January, is reached in the lower Lena valley. This is colder than corresponding latitudes in Canada, and it is the coldest known region of the earth's surface: a temperature of $-93°$ F. has been recorded at Verkhovansk.

In summer temperatures run high for a few weeks, as in Canada: Labrador's inclement climate is paralleled by the north-eastern peninsula, where the climatic rigour is emphasised by the Stanovoi Mts; both are at the north-west corner of a vast ocean basin. In the three inland basins, with their aridity and clear skies, the summer temperatures rival those of Iraq and Arabia.

From the Ukraine to the Pacific

Before the Russian Revolution the whole of Northern Asia was loosely designated Siberia, about which few knew anything save that it was a place to which the tsars sent their political prisoners and chief criminals. With the advent of the Bolshevik regime the administrative system was completely overhauled, and the word Siberia has now a much more limited application.

As stated in the Lesson on Soviet Russia in Europe, the Soviet Union consists of a number of constituent Soviet Socialist Republics. By far the largest of these, in territory and population, is the Russian Soviet Federal Socialist Republic (R.S.F.S.R.), which extends from the borders of the Ukraine in Europe right across Asia to the Pacific.

It is divided for administrative purposes into a number of territories, regions, autonomous soviet socialist republics, and autonomous regions. Altogether it comprises three-quarters of the total area of the Soviet Union, and it lies for the greater part in Asia—Soviet

geographers pay little or no regard to the conventional separation of Europe from Asia by the almost gentle slopes of the Ural Mountains—but the population of the Asiatic portions is far sparser than of those in Europe. It contains two of the Soviet Union's most important industrial areas the Urals and the Kuzbas.

The Ural Industrial Area

On the borders of Europe and Asia the Ural industrial area is centred about the regions of Sverdlovsk and Chelyabinsk ; in the production of coal, electricity for industrial uses, iron and steel, it takes a high place. The cities of Sverdlovsk and Chelyabinsk are centres of heavy engineering industry. Another big industrial city is Magnitogorsk, one of the most romantic creations of modern times.

As recently as 1929 the site of Magnitogorsk was occupied by the obscure village of Magnitnaya (magnet mountain), and the cattle of Cossack peasants grazed on the slopes of what is a mountain of iron ore. Within a few years a city of nearly 150,000 people came into being there, with power plants, batteries of coke ovens, and blast furnaces. Nizhni Tagil is another metallurgical and chemical centre. Orsk has iron and steel works, oil refineries, and locomotive works.

From one end of the Urals to the other runs a chain of oil-wells, sited on an extension of the oil-bearing strata running north from Baku in the Caucasus. Derricks tower above the ice at Pechora, break the skyline at Cherdyn and Perm, line the banks of the Kama and Emba, and are prominent at Sterlitamak, south of Ufa, and Chapayev, at the head of the Caspian Sea.

Vast Coal Deposits

Although there are plentiful supplies of coal in the Urals there is not enough to keep all its plants going at full blast ; or, rather, there is not sufficient coal of the right coking quality. So it is that the Ural industrial area has been linked by rail with the Kuznetz coal basin - Kuzbas, it is called 1,200 miles away in Western Siberia, near the foothills of the Altai mountains. Here are coal desposits of enormous size, among the largest in the world.

Coal from Kuznetz is carried by rail to Magnitogorsk, ore from Magnitogorsk is taken on the returning trucks to Kuzbas, and at both ends are great metallurgical establishments. Iron and steel are also supplied by Kuzbas to the industries of the Far Eastern area The Urals region receives coal from the Karaganda coalfield in Kazakhstan.

In Kuzbas the largest town is Novosibirsk (pop. 750,000). Kemerovo, in the heart of the coalfield, and iron and steel centre of Stalinsk, each have about 200,000. Tomsk (pop. 150,000) makes aircraft.

The steppe to the west, once roamed over by a few nomad tribes, is now a large cereal and beet-sugar producing region, with Semipalatinsk (pop. 110,000) as the centre for flour-milling and meat-packing. Barnaul has cotton mills, the cotton being brought by the Turk-Sib. railway from Soviet Central Asia.

Soviet Central Asia is not a part of the R.S.F.S.R. but is divided between five S.S.Rs. The largest of these is Kazakhstan. The others are the Uzbek, Turkmen, Tadzhik, and Kirghiz S.S.Rs. In the days of the tsars this region was called Russian Turkistan.

The soil is largely desert, the winters are bitterly cold, the summers sub-tropical in their heat. The population, about 16 millions in all, is not Russian but Turki or Sart, akin to the Iranians ; the prevailing language is Turki, and those who profess a religious faith are more often than not Muslims.

Kazakhstan

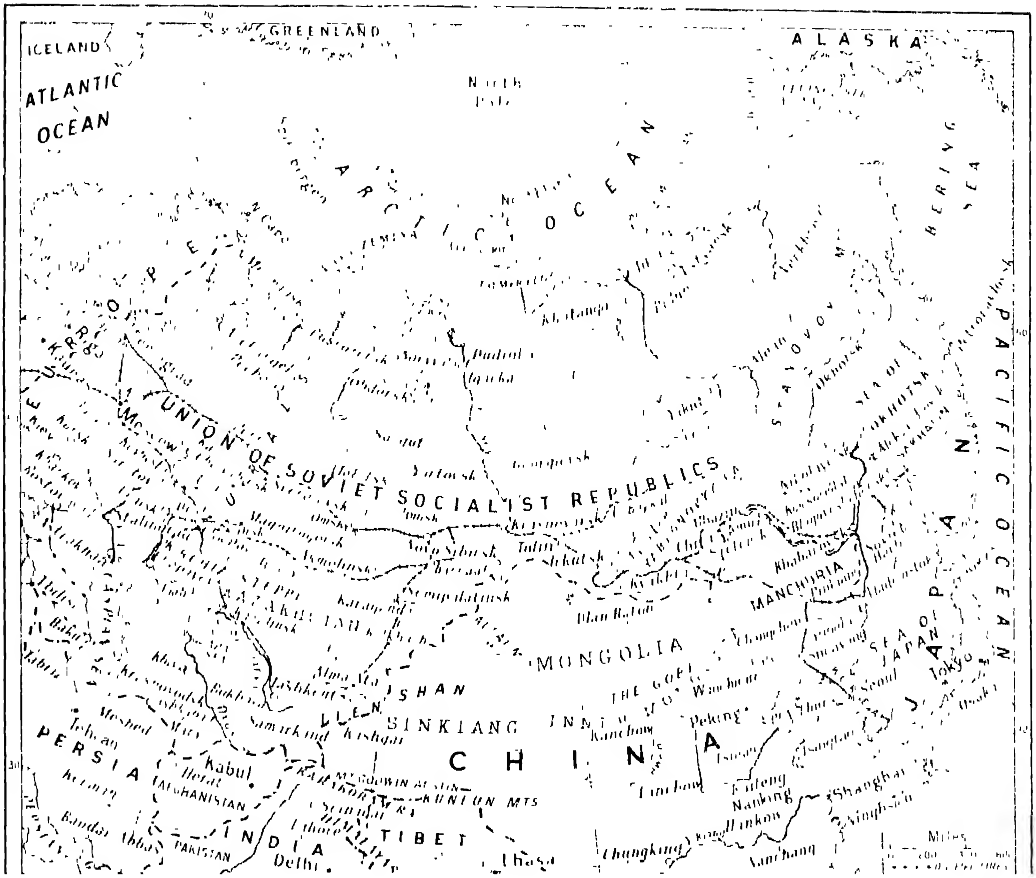
The monster S.S.R. of Kazakhstan—over a million square miles, but with a population of only 6 millions lies south of the Ural-Kuzbas region. A few years ago the Kazakhs were nomads living in felt tents. Now they work in collective farms, in the coal-mines of Karaganda, at the oil-wells on the river Emba, in copper-smelting works and railway yards.

In the north and north-east, in the black-soil belt, grain is produced. It is the hope of the Soviet planners that Kazakhstan shall become "the new bread-basket of the Soviet Union." Kazakh horses are prized throughout the Union. Kazakhstan contains about 60 per cent. of the U.S.S.R.'s known resources of lead, 50 per cent. of its zinc, and much copper and nickel

Largest City in Central Asia

Most westerly of the other four republics in Soviet Asia is Turkmenistan, extending from the shores of the Caspian to the frontier of Afghanistan. Next comes Uzbekistan, followed by Tadzhikistan and Kirghizia, on the borders of Sinkiang. All are thinly peopled, the Uzbek state being the most populous with about 6 million.

Before the Russian Revolution the whole of this great area was ruled by the Russian governor-general of Turkistan and the khan of Khiva and the emir of Bokhara. Khans and emirs have been swept away, and all that they stood for ; the cities which for so many centuries were famed in fable and story are now mostly in ruins and altogether subordinate to the great new Tashkent, which, with a population of 600,000, is the largest city in Central Asia.



SOVIET ASIA. Vast area of the U.S.S.R., showing also neighbouring countries.

Tashkent is the capital of Uzbekistan, and the economic and cultural metropolis of the whole region. It has a great agricultural machinery plant, the giant Stalin cotton mill, and light industries. Near by are coalfields, and not far away are large petroleum deposits.

The area between Tashkent and Samarkand, the fertile Fergana valley, grows cotton, grain, rice, and fruit. More than half of the Union's cotton needs are supplied by the Uzbek fields.

In Turkmenistan, too, cotton growing is of supreme economic importance, and the same is true of Tadzhikistan. The chief city is Ashkabad (pop. 120,000), with Merv next. Third is Krasnovodsk, where the Trans-Caspian railway has its beginning. Tadzhikistan and Kirghizia are comparatively small. Stalinabad and Frunze are the respective capitals (pops. 110,000 and 140,000).

From this incursion into Central Asia let us return to the R.S.F.S.R. As already stated, the whole of Asia from the Urals to the Pacific forms part of this, the greatest of the components of the Soviet Union.

East of the Urals, stretching from the shores of the Arctic to the Mongolian border, lie the Western and Eastern Siberian Regions, with their capitals at Novosibirsk and Irkutsk. The former contains the Kuznetz basin (Kuzbas). Irkutsk has about 300,000 people. Krasnoyarsk much the same. North-west of Irkutsk is the Cheremkhov coalfield ; another is south-west of Krasnoyarsk.

Buriat-Mongol

The Buriat-Mongol autonomous republic lies to the south and east of Lake Baikal. It is inhabited chiefly by Buriat-Mongols who rank as the most advanced of the non-Russian tribes inhabiting " Siberia." They are herdsmen for the most part, as their fathers have been through countless generations, but their yurts (felt tents) are giving way to the Russian izbas (cottages). the Shaman or medicine-man is being driven out

of business by state doctors and school-teachers, and the flowing garments once the vogue are replaced by overalls and suits. Leather and glass are the principal industries. Tin deposits at Gusinoe lake are worked. Dzhida has the most prolific tungsten mine in the U.S.S.R. Ulan-Ude (formerly Verkhne Udinsk) is the capital.

The Far Eastern Region

Eastwards lies the vast Yakutsk A.S.S.R., nearly a million and a half square miles in area but with a population of only 450,000. Yakutsk is the capital. Hunting and gold-mining are the principal economic activities, but the severe climate and the lack of communications militate against development. Yakutsk and Irkutsk are linked by airway.

The Far Eastern Region is an area of nearly a million square miles, with a population of over 3,600,000. Stretching along the whole of the Soviet Union's seaboard on the Pacific, it has been developed as a practically self-sufficient political and economic unit, because it is too distant from the west to be administered successfully otherwise. Much of its surface is mountainous or covered with forest, but its importance as a reservoir of minerals can hardly be over estimated. Khabarovsk (pop. 300,000) is the principal city, with heavy industry plants, oil refineries, and railway shops.

The lower reaches of the Amur river are one great industrial area, with Nikolayevsk as its port. Khabarovsk is on the Trans-Siberian railway, where it bends south to Vladivostok, the railway's terminus and a Soviet naval base; if not ice-free in winter Vladivostok's harbour can be kept open by ice-breakers.

Near the tip of the Kamchatka peninsula is another Soviet naval base—Petropavlovsk. The big island of Sakahlin has the only oil-field in operation in the Far East. The crude oil is taken by tankers or pipeline to be refined at Nikolayevsk, Komsomolsk, and Khabarovsk.

Trans-continental Railways

Greatest of all the Soviet railways is the Trans-Siberian, which begins at Chelyabinsk, in the Urals, as a continuation of the main line from Moscow. Begun in 1891, it was completed right through to Stretensk, on the Shilka, the head of navigation on the Shilka and the Amur —4,076 miles from Moscow, 2,710 miles from Chelyabinsk in 1905.

To meet it a line was built from Vladivostok to Khabarovsk, but the cost of joining Stretensk to Khabarovsk was so enormous that the tsarist engineers continued their line from Chita across Manchuria (then Chinese) to Vladivostok the Chinese Eastern railway.

During the First World War the direct line was continued from Stretensk on the Russian side of the boundary with Manchuria to Khabarovsk, the link with Vladivostok. Under the Soviets the Trans-Siberian has been completely double-tracked in places triple-tracked.

Feeling that the Trans-Siberian was too near the frontier to be strategically comfortable, the Soviet engineers set about the construction of a loop line north of the Trans-Siberian—from Taishet, in Eastern Siberia, east of Krasnoyarsk, through the Bodaibo-Lena goldfields, north of Lake Baikal, to Komsomolsk and Sovietskaya.

This line is in effect a second Trans-Siberian since it has been extended westwards, through Barnaul and Akmolinsk, to Chkalov (Orenburg) and Chapayev on the northern shore of the Caspian Sea.

Other Famous Lines

So much for the trans-continental lines. Returning to the south-west, there is the Trans-Caspian railway, running from Krasnovodsk on the Caspian through Merv, Bokhara, Samarkand, and Khokand to Ferghana, with a branch to Tashkent. Then there is the famous Turk-Sib, opened in 1930, from Novosibirsk, on the Trans-Siberian in the heart of Kuzbas, then via Semipalatinsk to east of Lake Balkhash, through Alma-Ata and Jambul to Aris and thence south to Tashkent.

The Chkalov-Tashkent line runs from Chkalov (once Orenburg) to the central Asiatic metropolis via the Kirghiz steppes, touching the north-eastern corner of the Aral Sea and passing up the Sir Darya valley. From Magnitogorsk in the Urals industrial area a railway goes to Lake Balkhash and is connected with the Turk-Sib, between Alma-Ata and Tashkent. It runs through the Karaganda coalfield, and provides Soviet Asia with fuel for its expanding industries. Great as is the Soviet railway system, recognition must be paid to the incomparable airways network.

Arctic Regions Developments

In some ways the most interesting developments are in the Arctic regions. The original impetus came from the desire to establish a passage-way across the top of the continent which ships and planes could follow from east and from west, thus reducing the distance of Murmansk from Vladivostok to 6,000 miles instead of 14,000 round the Indian Ocean or through the Panama Canal.

Under the auspices of the North Sea Route Administration a number of "polar stations" came into being, charged with weather forecasting, etc. Of newer ports along the Arctic coast the most important are Igarka (200 miles up the Yenisei), Noviport on the Ob, and Tiksi on the Lena delta. The Northern Sea route was officially declared open throughout its entire length in 1934.

LESSON 24

The Three Americas

THE Americas, North, Central and South, together extend from about 80° N. to 70° S.—150°, or 10,000 miles. This extent includes the South Shetlands south of Cape Horn. Along lat. 49° N., part of which is the boundary between the U.S.A. and Canada, North America is some 3,000 miles across, through 70° of longitude, and some 3,000 miles from north to south—New Orleans to Baffin Land. Between Port Arthur and Winnipeg is the centre of this mass of land.

Central America is a mainland isthmus which almost disappears at Panama and the West Indian islands. South America, at the latitude of Trinidad, is 15° across, 1,000 miles; at the Equator in the same latitude as the mouth of the Amazon it is twice as wide; 5° farther south, at the latitude of Cape San Roque, it is 3,000 miles across, as wide as the widest part of North America.

Thence southward it narrows steadily. From Buenos Aires to Trinidad is about 3,000 miles, Cape Horn being more than 1,000 miles farther south.

Along the north the continent forms the rim of the Arctic basin, which is over a mile deep and has no coastland over a mile high, except in Northern Greenland. West of the Great Lakes is the true edge of the basin, separating it from the expanse across which the Mississippi drainage system wanders towards the Gulf of Mexico.

Pacific Coast

The Pacific coast is backed throughout with high ground—at its widest some 800 miles across—which is a mile high and has patches over two miles above sea-level. This high area, the Rockies and the Andes, and their connexions and outliers, are scarp-edged to the east and cut up and diversified to the west.

Between the rim and the coast are upland and lowland basins, some with internal drainage, as into the Great Salt Lake, others with narrow gorges as outlets, all more or less longitudinal, running from north to south along the axis of the heights.

Some of these valleys have been drowned, e.g. the Gulf of California and the Gulf of Ancud in Chile; others lie trough-like between coastal ridges and the inland heights, like the valleys of California and Chile; some have almost lost their identity, for the western side is but a festoon of islands.

From the shore the Pacific drops quite quickly, there is virtually no continental shelf, and the tidal variations are unimportant. Here the valleys outside the trade-wind belt are fertile, usually with typical winter rains; and wherever the rainfall suffices the slopes are forest-clad. These coastlands are suited to be the homes of fishers, foresters, and fruit farmers.

The heights are composed of relatively young folded mountains and are metalliferous; gold, copper, petroleum, etc., stimulate growth of population, which originally came to these lands by sea, for the connexions by trans-continental railways with the east are comparatively recent, especially in the south and extreme north.

Atlantic Coast

The Atlantic shores are different. The continental shelf is wide; it includes, for example, the Falkland Islands. The coastal lowlands are similarly wide, and the configuration of Delaware and Chesapeake Bays and of Cape Hatteras indicate gentle slopes across which the actual tide-level is an accident of the slight variations in height.

Florida and Yucatan are both lowland peninsulas. In Mexico the eastern scarp-edge of the Pacific heights reaches the Gulf Coast. The northern coast—the coast north of the Equator—of South America on the Atlantic is reached by bifurcating spurs of the Andes with longitudinal valleys, as far as Trinidad; then come the Orinoco lowlands, backed by the Guiana highlands. Thence south-east from the Amazon delta lie the Brazilian lowlands.

The remainder of the coast of Brazil, south of Cape San Roque, is defined as an eastern bulge of the continent by the Brazil heights. This downland country rarely reaches a mile in height, yet has a wider coastal plain and a wider undersea shelf than Peru and Chile.

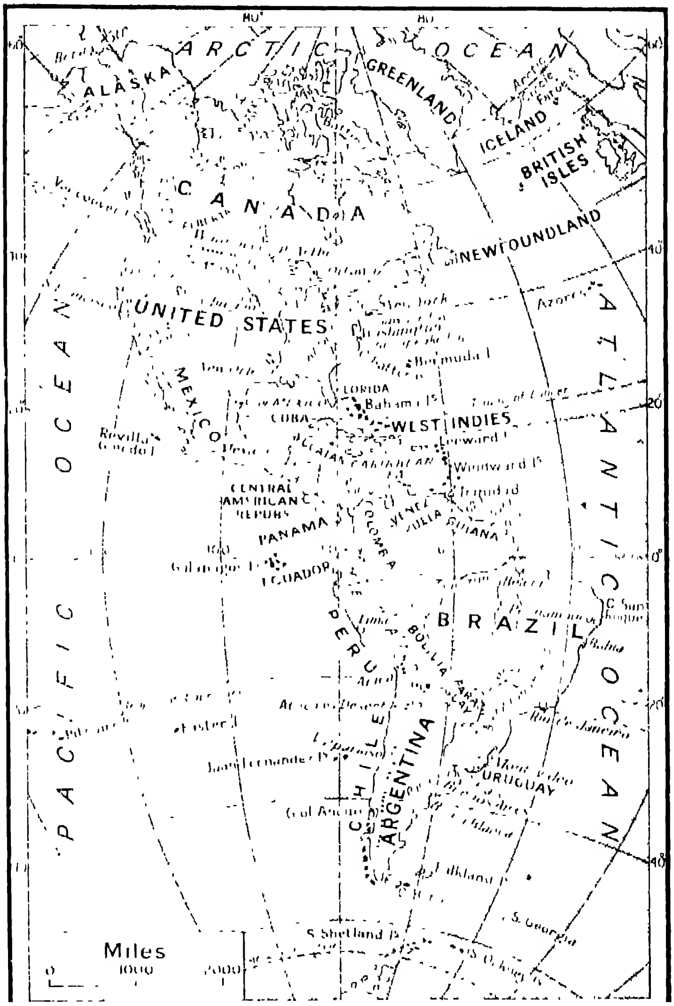
The Argentine coast at first is low, and here a slight change in ocean levels would reproduce the Gulf Coast, with the Plate river to parallel the Mississippi; south of 40° S. the interior is plateau; the coastal sill is narrow above the sea-level, wide below it. The Atlantic coasts are accessible from the ocean, and lead inland, except in the neighbourhoods of New York and Rio de Janeiro.

Fishermen, foresters, traders, farmers on the small scale prevalent in Europe, can here thrive, and the cultivation of cotton, tobacco, and coffee, to which these coasts are peculiarly suitable, provides an additional incentive to growth in population; here has grown the greatest settlement of Europeans overseas.

The centre of both North and South America is lowland with very slight heights of land

separating the immense drainage basins Mississippi, Mackenzie, Amazon, and Plate. The interior lowlands, by their extent, by their north and south range, by their nearness to oceanic influence, are cultivable and arable land.

Of these interior lowlands the basin of the Mississippi is a unique phenomenon. For all practicable purposes the basin is flat; nowhere else, except possibly in Western Siberia, does flat land extend so far in all directions. Across it sweep the winds, sometimes with tornado strength; across it, in the main from east to west, run traffic lines, rail and road and air-route. On it has developed perhaps the world's greatest example of mechanised farming, the world's greatest belt of raw cotton.



THE THREE AMERICAS: North, Central, and South.

Climatic Features

Climatically N and S. America should show the climatic regions in pairs; there is only one equatorial hot wet area, Amazonia; there is only one tundra, along the Arctic; the deserts pair, the Atacama in the south and the semi-arid Arizona, etc., in the north; the Mediterranean regions pair in Central Chile and in California; the inland summer rain regions pair in the middle lowlands, though the transition from the hot winters of the Gulf states to the frost-bitten winters of Alberta is not so definite in the south, where the tapering land means more definite sea modification of winter's rigours.

In relatively similar latitudes to Britain are Newfoundland and Vancouver in the north and the Falklands in the south, but none of these insular areas has the endowments of the British climate due to Britain's combination of position, westerly winds, westerly ocean drifts, the wide continental shelf, and the shallow seas.

The tropical forest of hardwoods is of relatively little value, for the wood is not saleable on the grand scale and the rubber has been superseded. The coniferous and deciduous forests are being depleted, and a dearth of soft woods of American origin is not merely threatened but is certain, for there has been little afforestation or forest conservation.

The pampas, the warm summer-rain grassland of the south, yields cattle, sheep, and wheat, and is one of the great producers of meat, wool, and cereals of the southern hemisphere. The corresponding warm summer-rain grasslands of the north in the lower Mississippi basin embrace the cotton, tobacco, and maize belts, which extend as the wheat belt to the prairie, where the grassland is frozen in winter.

Mineral Distribution

Minerals occur haphazardly. In the Appalachian system, behind the Atlantic coast in the U.S.A., is one of the greatest coal deposits in the world. Near the Great Lakes is a highly mineralised area where iron ore is mechanically shovelled in quarries, and where the bulk of the world's nickel is mined. Copper, silver, and gold occur in the western heights.

The bulk of the population is of immediate or ultimate European origin. South America is sometimes referred to as Latin America, because of the predominance of Spaniards and Portuguese in the original colonisers. In North America, especially in the U.S.A., the world is witnessing a vast attempt to absorb a heterogeneous mass of folk and to weld them into one people, for the States have had their Negroes from slave-trading days, they have had Teutons for centuries, and they have received Slavs and others from Central Europe, as well as Chinese and others from the Far East.

The process of amalgamation in the " melting-pot " proceeds slowly, and the influx of alien people was temporarily checked and brought under control in the first quarter of the 20th century.

LESSON 25

Canada

THE boundary line between Canada and the United States of America begins on the Pacific Coast at 49 N., passes through four of the Great Lakes and south of the St. Lawrence, and swings south to the Bay of Fundy.

North of this line to the rim of the Arctic Basin is Canada, with the exception of Alaska on the west, which is United States territory, and Danish Greenland. Only the narrow belt fringing the boundary is of real importance, and then only as a marginal land.

Physically, the land rises towards the south, and with the exception of the St Lawrence on the east, a rocky defile from the Great Lakes to the Atlantic Ocean, and the rivers of the British Columbian slopes on the west, the drainage is toward the Arctic. From Winnipeg to the Alaskan edge near the mouth of the Mackenzie is the line of the lake system : Winnipeg, Great Slave Lake, Great Bear Lake, and the connecting rivers. From this line the land rises in terraces to the Rockies.

There is tundra vegetation in the north, with temperate forest over most of the rest of the country towards the narrow marginal strip, where mixed woodland, grassland, and cultivation merge on the frontier in the middle of the continent into the prairie, the great American rolling grassland subject to summer rains and winter frost.

The higher ground of the Rockies and British Columbia on the west, and of the Maritime Provinces and Newfoundland on the east, is forest-clad ; Labrador is tundra. Ice is a nuisance in Hudson Bay, and in the Greenland and Labrador seas. The mid-winter temperatures are zero or below ; there are over 30 degrees of frost everywhere except along the margin, where the temperature in January is still 10 degrees of frost at least, and this in the latitudes of southern England. The temperatures in July range from 40° F. in the north to about 65° F. on the frontier.

British Columbia is, on the whole, cooler than Britain. The Maritime Provinces, Nova Scotia, New Brunswick, and Prince Edward Island, are similarly cool with evenly distributed rainfall ; they are, therefore, marginal lands, comparable with the Baltic countries in the matter of cultivation.

The north is dry, and the southern interior margins experience only scanty rainfall during the hot weather , the line of increasing rainfall in the summer extends from the mouth of the Mackenzie, through Winnipeg, into the U.S.A., to terminate in Florida.

Capital Cities

A population of some 14 millions is spread throughout the area of nearly 3·8 million square miles. Greater Montreal, the commercial capital, and Greater Toronto each have more than a million. Ottawa, the political capital, has 202,000. Hamilton and Quebec, the French-Canadian centre, have each fewer than 200,000 inhabitants. On the Pacific coast is Vancouver, with 531,000 people, including its suburbs.

Inland is Winnipeg, the queen city of the prairie, a railway centre and a focus for the Canadian grain trade, the fourth city of the country, with some 234,000 people. Windsor in Ontario has 121,000, Edmonton and Calgary in Alberta, in the lee of the Rockies, 159,000 and 127,000 respectively.

Politically, Canada is a long east-west strip , the boundary is really an accidental line across the natural regions. All the same, a number of natural regions within the boundary may be designated.

With a climate milder and moister than most other parts of the country, the three provinces of New Brunswick, Nova Scotia, and Prince Edward Island contain much fertile farmland. Of recent years the tendency has been towards an increase in dairy farming at the expense of grain-fields.

Products of Land and Sea

The orchards of the Annapolis and Cornwallis valleys in Nova Scotia are renowned. The fishing industry is of considerable importance ; the prolific waters of the St. Lawrence Gulf and the Banks of Newfoundland are in easy reach.

The forests afford great scope to lumbering, but more important is the mineral wealth. Nova Scotia has important coalfields, particularly in Cape Breton, furnishing nearly half of Canada's output of coal. There are smaller fields in New Brunswick.

Prince Edward Island has a valuable oyster industry. The rich red soil is well suited to potatoes, oats, hay, and dairy farming, hence the name "the Garden of the Gulf." Halifax in Nova Scotia, is one of the principal Atlantic ports, and in most years is free from ice all the winter.

St. Lawrence Lowlands

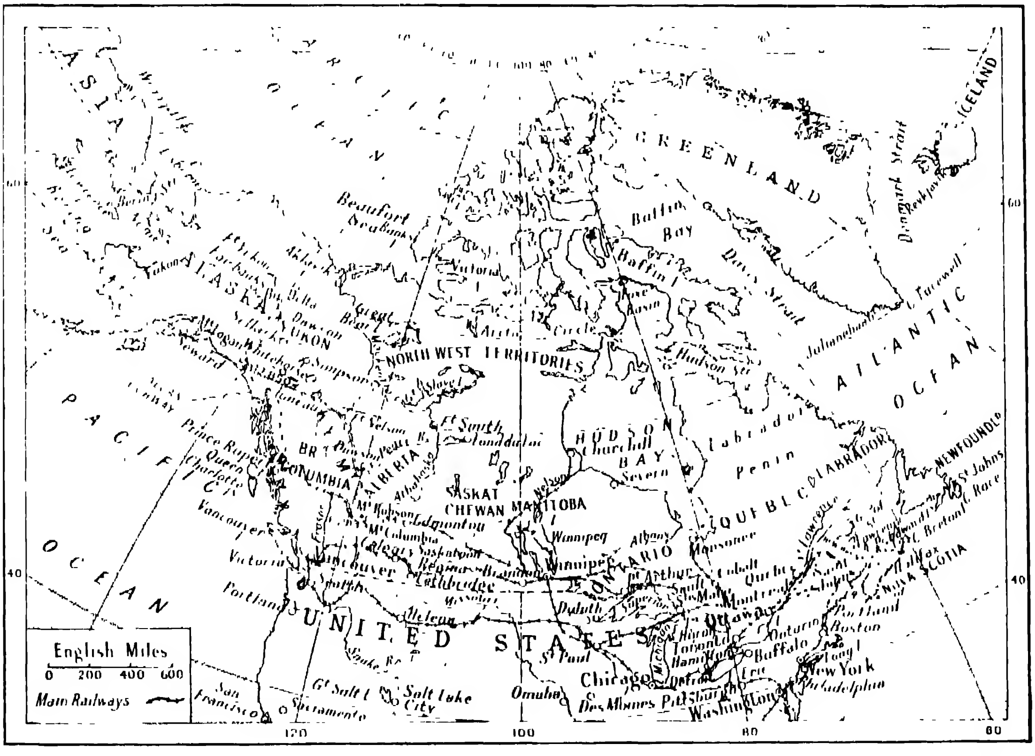
Stretching from Quebec through Montreal, Ottawa, and Toronto, to Detroit, the St. Lawrence lowlands contain a large part of Canada's agriculture and manufactures. Dairying, fruit farming, and stock-rearing are preferred to grain, which can be produced more cheaply and easily on the comparatively virgin soils of the prairie far to the west. Leading industries include pulp and paper, metal smelting and refining, textiles, cigars and cigarettes, railway rolling-stock, flour, boots and shoes, saw-mills, meat packing and breweries.

Deficiency in fuel is to a large extent remedied by water power from the St. Maurice, Saguenay, Lievre, Ottawa, and St. Lawrence rivers. In proportion to their populations Quebec and Ontario use water power to as great an extent as any country in the world.

Communications with the U.S.A. are excellent. The Welland Ship Canal joining Lake Erie and Lake Ontario was opened in 1931. In 1951 Canada finally decided to reconstruct the St. Lawrence canals to enable vessels drawing up to 23½ feet to pass from the Great Lakes to tidal water at Montreal. The shortest, but perhaps the most important, of the Canadian canals is the Sault Ste. Marie ("Soo") Canal between Lakes Superior and Huron, which was constructed between 1889 and 1895. It is little more than a mile in length and has only one lock. The traffic through this and the canal on the United States side at the same place is much greater than that through the Panama Canal.

Laurentian Plain

North of the Great Lakes is the Laurentian plateau of ancient rocks, largely covered with forests that make it one of the big lumbering districts of Canada; also, it is immensely rich



CANADA occupies, except for Alaska (U.S.A.), the whole northern half of North America. It extends north from the 49th parallel of latitude to within a few hundred miles of the North Pole.

in minerals. Mines at Sudbury produce the bulk of the world's supply of nickel. Copper is worked in the same neighbourhood. Cobalt, on the boundary of Quebec and Ontario, has silver mines. Gold occurs at Porcupine, about 100 miles to the north-west. Iron deposits occur at various parts on the plateau, notably at Michipicoten, at the eastern end of Lake Superior, and in the Ungava region of northern Quebec and Labrador.

West of the Laurentian plateau and reaching to the foothills of the Rocky Mountains is a vast area very largely covered with glacial deposits of a stiff, compact, and fertile clay suitable for the growing of wheat and other cereals. The climate, too, is favourable ; it is continental in type, with warm summers and an ample rainfall.

Prairie Provinces

When to these natural advantages is added excellent communications by rail, one need seek no further for the reason for the predominance of Alberta, Saskatchewan, and Manitoba as producers of wheat for the world's tables. Winnipeg, the capital of Manitoba, is the great market for the grain from the west and it is the principal distributing centre for the needs of all the prairie provinces. North of the prairies the Athabaska-Mackenzie plains slope gently to the Arctic shore ; grasslands in the lower regions, they are covered with a thin forest as they near the ocean.

Uranium ores are important in the region of the Great Bear Lake. And Canada's economic position began to change rapidly with the discovery of oilfields in the Prairie Provinces—especially near Edmonton in Alberta, where the fields of Leduc and Redwater proved so productive as to warrant construction of pipelines direct to the Great Lakes and Vancouver.

Alaska Highway

Westward lies the Cordilleran region, consisting of the heights and slopes of the Rocky Mountains in Alberta and British Columbia, and in the north the Yukon province in the basin of the river of that name. With low temperatures and scanty vegetation, agricultural possibilities are slight, but the mineral wealth, as in Alaska, is tremendous.

Across this region runs the Alaska Highway, built in 1942 to facilitate the transport of war materials. Starting at Dawson Creek, on the boundary of Alberta and British Columbia, it runs through Fort St. John, Fort Nelson, Centreville, Watson Lake, Whitehorse (in Yukon), Boundary, and so into Alaska, to terminate at Big Delta, where it links up with the road to Fairbanks. The 1,523 miles of road were built in just over eight months.

British Columbia

Between the Rocky Mountains and the Pacific coast is the mountainous and deeply-indented province of British Columbia. It faces away from the rest of the continent, and it has a climate mild in winter and cool in summer with plentiful rain. Forests are almost everywhere, and lumbering is important. Gold, copper, lead, and coal are worked, and the province has vast water-power resources. Of special interest is the Kitimat scheme creating an aluminium-smelting town in what was formerly almost uninhabited forest country . the necessary water is brought through a tunnel in the coast mountains. In the valleys are many farms, and there are excellent fisheries. Altogether, a land rich in economic possibilities, but the population is only just over one million.

Railways

Canada is built up on railway communication. True, the waterways—Canada has a system of river, lake, and canal navigation of some 2,700 miles—are of very great importance ; but it is the railway that has made possible the development of the prairies. The railways, comprising 42,956 miles of single track, are divided between the Canadian National Railways, owned and worked by the government, and the company system of the Canadian Pacific Railway.

The National system includes two transcontinental lines. The main line of the Canadian Pacific runs from Montreal to Port Arthur, Winnipeg, and Calgary, crosses the Rockies by the Kicking Horse Pass, and so on to Vancouver. There are many branch lines of both the National and Canpac systems, and the latter has important connexions with Chicago and other U.S.A. centres.

Newfoundland

Newfoundland, with its dependency Labrador, was formerly a separate British dominion, but in 1949 joined Canada as the tenth province. With an area of some 42,000 square miles (exclusive of Labrador), the population is only some 350,000, for much of the land is forest-covered. St. John's (67,700) is the capital.

Cod fisheries are the economic backbone of Newfoundland. Iron ore of excellent quality is mined with remarkable ease on small Bell Island in Conception Bay, within 18 miles of St. John's. Goose Bay airport is the last North American stopping-point on the Great Circle air route to Europe.

LESSON 26

The United States of America

THE continental United States cover an area of approximately three million square miles. The population at the 1950 census was over 154 millions, of whom over 15 millions were Negroes.

The Union is composed of 48 states, largely independent so far as their local affairs are concerned, with the national capital at Washington (pop., 802,178), in the Federal District of Columbia—*not* in the state of Washington, which faces the Pacific 3,000 miles away.

The physical structure of the country may be broadly outlined: a coastal strip facing the Atlantic and the Gulf, the Appalachians, the Great Plains, the Rockies, and the Pacific slope. Each of these has, of course, innumerable subdivisions, each with its characteristics of natural feature and human occupation. But in common speech and usage the states are classified into the following ten main regions.

Historically, the New England states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut have been of the greatest importance and to-day their position, economically and socially, is still of the first order. Here some of the earliest colonies were founded, and the traditions of farming go back to the days before the Independence War. Fishing is another of the occupations of the first settlers that is still followed.

To-day manufacturing, particularly small-scale manufacturing, is the principal interest of the great majority. Providence, in Rhode Island, Fall River and New Bedford, in Massachusetts, constitute the heart of the textile area, one of the most important of the industrial areas of the U.S.A.

Boston is not only a cultural centre but a prominent manufacturing city specially interested in the woollen trade and sugar refining. Boots and shoes are another New England speciality. Abundance of water led to the establishment of a pulp and paper industry. The six states together have a population of some 9·2 millions. Boston ranks first among the New England cities with its 791,000 people.

New York State

The "empire state" of New York contains about a tenth of the population of the Union. New York City had a population of 7,891,957 in 1950. It is the business metropolis, the financial centre, and shipping mart. Its industries are innumerable, but clothing takes first place.

The amusement industries are important—New York is the American equivalent of Paris—and in these, as in the garment trades, the Jewish element is preponderant. The Wall Street financiers and "big business" chiefs are drawn from the Anglo-Saxon Protestant section of the people. Politics are controlled by the Irish, supported by fellow-Catholics, the Poles, and the Italians.

South of New York are the three states of Pennsylvania, New Jersey, and Delaware. The first-named ranks next to New York as the Union's most populous state: nearly 10½

THE EASTERN STATES of the United States of America.

millions, compared with New York's 14·8 millions. Philadelphia, the state capital, with over two million people, has been to the fore as an intellectual and artistic centre almost since its foundation by the Quaker, William Penn; to-day it is also a great manufacturing city.

Taking the three states as a whole, the climate is temperate and stimulating; the soil is good, providing a basis for wide and varied farming; and communications are excellent. In eastern Pennsylvania are America's greatest anthracite deposits, on which has been erected a gigantic structure of heavy industry centred on Pittsburgh (677,000). There is bituminous coal, too, as indeed there is throughout the Appalachians.

Industrial Centre

Between the Alleghenies and the Prairies, the Great Lakes on the Canadian border and the line of the Mississippi-Ohio-Potomac rivers is America's true industrial centre—in the states of Wisconsin, Illinois, Indiana, Michigan, and Ohio. Here a fifth of Americans have their homes and places of work.

The richest deposits of iron ore are in the north-western tip of Michigan and the adjacent district of Minnesota. The richest deposits of coal are in Pennsylvania and West Virginia; the ore is shipped down the Lakes to Cleveland, Buffalo, and Toledo, ports on Lake Erie, where it meets the coal brought from the Pennsylvanian coalfields. Pittsburgh is rivalled as a steel-producing city by Cleveland and Youngstown in Ohio, Buffalo in New York, and Chicago in Illinois.

Chicago, the second city in the U.S.A. (pop. in 1950 was 3,621,000), is situated where the railways from the east to the north-west must converge in order to turn the corner of Lake Michigan, and it is thus a great meeting-place of land and water routes, a collecting-centre for the wheat of the prairies, the livestock of the Great Plains, the iron ore of Michigan, the coal of Pennsylvania. It is the chief city engaged in the meat-packing industry.

The Middle West

Large coalfields are in the Middle West: the Eastern Interior in Illinois chiefly, the Northern Interior in central Michigan. The coal belt is continued in a great sweep as the Western Interior, from Iowa to Arkansas. Detroit, America's fifth city (1,849,500), is a chief centre of the automobile industry, and rubber-tyre manufacture is a speciality of Ohio.

The Middle West has also a large and flourishing agriculture, finding its market in the enormous populations of the congeries of cities south of the Great Lakes. Wisconsin is sometimes referred to as the "dairy state."

Beyond the Middle West are the prairie states of Minnesota and Iowa, the two Dakotas, Nebraska, and Kansas. The climate is continental, suited for wheat cultivation; trees are few and forests none at all, so that there are no physical bars to the spread of large-scale, highly mechanised farming.

Across the northern part spreads the spring wheat belt; then comes the maize belt, reaching across the Middle West; then comes the belt of winter wheat interspersed with corn (as the Americans call maize).

Minneapolis (517,000) claims to be the world's largest flour-milling centre; Milwaukee (633,000) and Kansas City (453,000) are similarly engaged, though all three have a multitude of other interests. Kansas in particular shares slaughtering and meat-packing with Chicago. The prevailing one-crop system—spring wheat in the north, winter wheat or corn in the south—tends to long-term impoverishment of the soil, and this, coupled with very low and very variable rainfall, frequently accounts for the hard times that the prairie farmers undergo in certain years.

The Far West

Under the name of the Far West are included the eight mountain states of Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, and Nevada. In area they account for more than a quarter of the Union, but their population all told is a mere 5 millions. The western boundary of the region is the jagged mountain chain of the Sierra Nevada and the Cascades, its eastern the foothills of the Rockies. In between is a vast, scantily-watered area, much of it desert.

As might be expected, the industries are few and undeveloped; but the mineral wealth is varied and immense. Coal is worked along the eastern edge of the Rockies. Gold and silver are obtained in large quantities from the mines of Colorado. New Mexico is abundantly rich in silver. Idaho and Utah produce lead, as well as the precious metals. Arizona is the Union's chief source of copper.

Cultivation is confined in the main to the river valleys where irrigation is possible. An outstanding example is the northern and central parts of Utah, where the Mormons, who have plenty of local labour available, have developed a large sugar-beet industry as well as producing wheat, alfalfa (lucerne), etc. Wyoming, the state of the old-time "cattle kings," produces much of the material for the slaughter-houses of Chicago and Kansas City.

Pacific States

The Pacific States comprise America's western or Pacific frontage—California, Oregon, and Washington, whose surface is taken up by the Cascade and Sierra Nevada mountains and a not very extensive coastal plain. In the mountains Mt. Whitney (14,495 ft.) is the highest in

the U.S.A. Rockies the rainfall is heavy, and the Pacific forest gives rise to the important lumbering industry of Washington and Oregon

Washington has considerable coalfields, and California prolific oilfields. Gold is found in the Sierra Nevada in California. This latter state, extending for some 700 miles from north to south, and intersected by the coastal ranges as well as the western heights of the Rockies, has a great variety of climate, so that parts are very dry while others are semi-tropical, producing oranges and lemons, grapes and figs, and other fruits. The fisheries are a prominent industry.

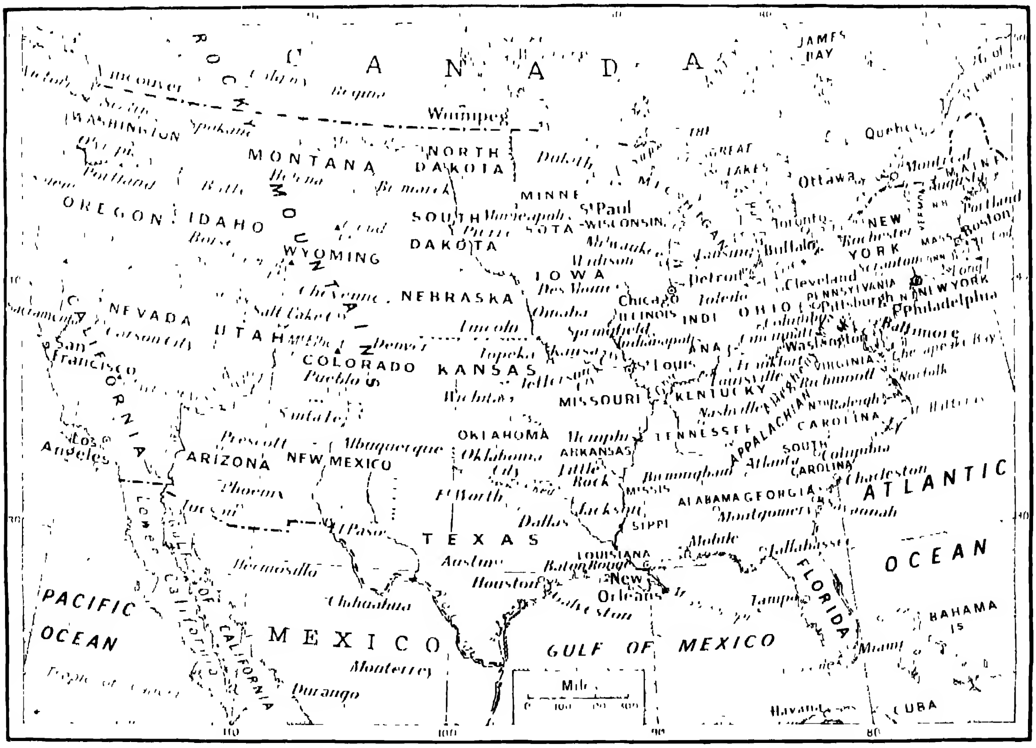
Los Angeles is the biggest city on the Pacific slope and America's fourth city, with a population of 1,970,400 ; it is the centre of a busy industrial area, whose activities range from fruit packing and oil-refining to the production of motion-pictures for all the world's cinemas. Hollywood is a suburb. San Francisco is a much older city, a port as well as business centre It has some 761,000 people ; Sacramento, the capital of California, has only 137,500 In Oregon there is Portland (373,600), in Washington there is Seattle (467,600), a port whose greatness has been built on the exports of grain and timber.

Just as the Far West is not as far west as the Pacific states, so the South-West is really in the south : it includes the states of Texas and Oklahoma. Texas is the largest of all the 48 ; with its 267,000 square miles it is more than four times the size of England and Wales, bigger than France or indeed any other of the European countries save the Soviet Union. But its population is only just over 7½ millions.

Its west is the land of the cowboy, its east an extension of the cotton belt of the southern states in 1950 it produced more cotton than any other of the states Houston, connected by a ship canal with the Gulf of Mexico, is second only in importance to New York as a commercial port and is the world's largest inland cotton market But more important than its cattle or its cotton is its petroleum. Some 20 per cent. of the world's supply comes from the state, and Texas with the neighbouring Oklahoma produces a third of the world's total.

The Border States

In the heart of the eastern half of the U.S.A. lies a group of states which belong neither to the industrialised region to the north nor to the "cotton states" of the south. These border states are Maryland, West Virginia, Kentucky,



UNITED STATES OF AMERICA **Sketch map showing the 48 constituent states.**

Tennessee, and Missouri. Maryland has mixed farms and the port of Baltimore (950,000).

West Virginia has, as already noted, an important coalfield. Kentucky's blue grass region is famed for its horse-breeding ; it has a coalfield and many varied industries. Tennessee's chief products are coal, cotton, and tobacco.

Missouri is in fact the central state. Lying in the maize belt, it is also the greatest manufacturing state west of the Mississippi St. Louis, its capital, with some 857,000, is the gateway for north and south travel and transport of goods, lying as it does at the junction of the continent's two greatest rivers, the Mississippi and the Missouri Kansas City is another important centre.

The Southern States

Finally there are the southern states of Virginia, North Carolina and South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, and Louisiana. They form the great cotton belt, and originally their economy was based on the labour of Negro slaves.

One of the results of the Civil War of 1861 to 1865, between North and South, was the emancipation of the slaves ; another was the crippling for many generations of the southern producing and social systems. Still to-day the South is the most backward in education, in health, business development, and public welfare, but big strides have been made towards a more prosperous state of affairs

In the Southern Appalachians coal and iron are worked. There are important oil deposits in Louisiana. Rice and sugar are grown in the more moist, low-lying districts, and tobacco is a main crop in practically all the southern states.

New Orleans, on the Mississippi delta, is the south's chief port, with a population of over half a million. Florida's wonderful summer-in-winter climate has made Miami and Palm Beach famous throughout the world as resorts for wealthy tourists.

"Father of Waters"

About one-third of the whole area of the U.S.A. is drained by the 2,560-mile-long Mississippi and its 40 tributaries. If the 2,950 miles of the Missouri from its source in the Rocky Mountains to its confluence with the Mississippi 20 miles above St. Louis -- are added to the 1,250 miles of the Mississippi's course from St Louis to the sea, then the two together form the longest river in the world (4,200 miles) Well might it be called "Father of Waters."

Alaska

With an area one-fifth that of the U S A., Alaska has only some 128,600 people of whom about 26 per cent. are of Indian or Eskimo stock. This does not take into account some 20,000 seasonal workers who go to Alaska during the summer months, to be engaged in mines, in canneries, and on railway construction. The climate is generally severe, so that agriculture in most parts is next to impossible.

The forests are extensive, but the wood is not good enough for export in large quantities. The mineral resources are abundant. Gold is obtained at Juneau, in the Seward peninsula, and in the Yukon basin.

In the U.S.A. there are over 236,000 miles of railway track--more than in any other country of the world. The waterways are similarly vast, including the Great Lakes and a wide system of canals.

LESSON 27

Mexico, Central America, and the West Indies

FROM the U.S A. there tapers, to the south, the Mexican plateau, which again narrows to the Isthmus of Panama. Here the grain of the land produces the western mountain rim, flanking the Pacific Ocean and forming the connexion between the Rockies and the Andes.

Here are the Mexican Republic, and the small states of Central America. Eastward lies the American middle sea ; its labels--Gulf of Mexico, Caribbean Sea—disguise its real character, for it is as definite a unit as the Mediterranean itself

Third in size of the Latin American republics (758,000 sq. miles ; surpassed only by Brazil and Argentina), and second only to Brazil in population (27 millions or thereabouts, largely Amerindian or "mixed"), Mexico consists for the most part of a plateau rising gradually to the south. Its eastern edge is the Sierra Madre Oriental, the western the Sierra Madre Occidental ; both overshadow a coastal plain lined with townships.

The lowest regions, the "tierra caliente" (hot land), ranging from sea-level up to 3,000 ft., produce tropical plants of all kinds ; there are plantations of sugar-cane, tobacco, and rubber. The "tierra templada" (temperate land) occupies the mountain slopes from 3,000 to 5,000 ft. ; here coffee is the chief crop, and great quantities are shipped to the U.S A.

BETWEEN MEXICO AND COLOMBIA are the six small republics, Guatemala, Salvador, Honduras, Nicaragua, Costa Rica, and Panama; also the British colony of Honduras. To the east are the West Indies.

The "tierra fria" (cold land) includes most of the plateau as well as the higher slopes of the mountain ranges. Cotton and wheat are grown, and pastoral farming flourishes, where rainfall or artificial irrigation permits. The total acreage of arable land is estimated at 60 million acres.

The break-up of the large estates and the redistribution of the land among the peasants have been a feature of recent years, and there has been some emulation of the Soviet system of communal farms (*ejidos*) on state-owned land. The Yucatan peninsula produces rather less than half of the world supply of sisal (henequen).

Mexico is immensely rich in minerals: lead and zinc, silver and gold, copper and iron and coal. But just as the surface of the land has been hardly scratched by the agriculturalists, so as yet the mineral wealth is very largely untapped. Development is in the hands of foreign companies who own over 90 per cent. of the mining properties. Most important of all are the oil deposits; in 1950 Mexico produced 74 million barrels of crude petroleum.

Most of the wells are situated in the Gulf coastal zone in the neighbourhood of Tampico, and they were owned by British, Dutch, and American companies until 1938, when they were expropriated by a decree of President Cardenas; they were then placed under a National Oil Administration, working in co-operation with the workers' trade union.

At about the same time the sugar industry and the railways were taken over from their mostly foreign ownership and converted into state concerns. These measures, coupled with the redistribution of land, were aimed at raising the standard of living of the masses as well as breaking the hold of foreign capital on the country's industry. Mexico, the capital city, has a population of over 2 millions. Next in size are Monterey with 340,000 and Guadalajara with 337,000. Tampico and Tuxpan are the chief centres of oil shipment, but Vera Cruz ranks as the principal port.

Central America

Between Mexico and Colombia, the first of the South American states, are the six small republics Guatemala, Salvador, Honduras, Nicaragua, Costa Rica, and Panama. There is also the British colony of Honduras. Nicaragua is the largest in area, but Guatemala with its 3,500,000 people is the most populous. Next to it in population comes Salvador, the smallest, but with over 1,950,000 people.

As in Mexico there are the three zones of *tierra caliente*, *templada*, and *fria*. Most of the region is mountainous, covered with thick tropical forests on the Atlantic slopes which receive most of the rains brought by the monsoons.

It is on the Pacific side that most of the people live. All are Amerindians or have Indian blood to a greater or less degree. Bananas, coffee, and sugar are the chief exports. British Honduras exports chicle gum, mahogany, coconuts, and bananas.

Running athwart the Republic of Panama is

the Canal Zone, ten miles wide, which is owned in perpetuity and with complete sovereign rights by the U.S.A. It is inhabited by a civilian population of some 53,000, of whom about one third are Americans. There is a considerable garrison of American troops. Begun in 1907, and opened to traffic in 1914, the Panama Canal is approximately 40½ miles long from shore to shore 50 miles from deep water to deep water. Some 6,000 ships pass through the Canal in a normal year, the majority of them American and British.

Broadly grouped into the Bahamas and the Greater and the Lesser Antilles, the West Indies comprise a multitude of islands, large or small, some independent but most possessed by one or the other of the great powers.

The West Indies

The British West Indies comprise the Bahamas, Barbados, Jamaica, the Leeward Islands, Trinidad, Tobago, and the Windward Islands. Of these the largest and most populous is Jamaica (4,404 sq miles; pop. about 1½ millions). Sugar, coffee, bananas, rum, and coconuts are its chief products Kingston, with a population of well over 100,000, is the seat of government as well as the principal port.

Bahamas consists of 20 inhabited and a great number of uninhabited islands and rocky islets off the south-east coast of Florida. Tomatoes are a chief product. Owing to their close proximity to America, the islands are a holiday-centre for well-to-do Americans. The Leeward Islands include Antigua, Barbuda, some of the Virgin Islands, St. Kitts, Nevis, etc.; they produce sugar and molasses, cotton, fruits, tobacco, and salt.

Trinidad lies close to the South American mainland, off the coast of Venezuela; to the north-east is the smaller island of Tobago, an administrative dependency Sugar, petroleum, and asphalt are produced. Between Trinidad and Martinique are the Windward Islands, of which the chief are Grenada, St. Vincent, and St. Lucia. Sugar and other tropical plants flourish, and cotton grown in St. Vincent is said to be the best in the British Commonwealth

Largest West Indian Islands

Greater and Lesser Antilles contain the largest of the West Indian islands: Cuba, a republic under the protection of the U S A., Hispaniola, divided between Haiti and the Dominican republics, both independent; Jamaica (British), and Puerto Rico, a self-governing "free commonwealth" in close association with the U.S A., ceded by Spain in 1898 following the Spanish-American war.

Cuba exports sugar and tobacco; the cigars made at Havana (pop 783,000), the capital, are world-famous. Both Haiti and Dominica are mulatto republics, backward in development Under American guidance Puerto Rico has made considerable progress.

The Lesser Antilles are divided between Britain (the Windward and Leeward Islands, Barbados and Trinidad), France (Guadeloupe and Martinique); the Netherlands (Curaçao), and the U S.A. (the rest of the Virgin Islands, purchased from Denmark in 1917). Martinique is noted for sugar production.

LESSON 28

South America: The Andean States

Along the Pacific coast of South America, from the swamps of the Panama isthmus to the frozen shores of Tierra del Fuego, and extending for hundreds of miles into the continental interior, runs the mighty chain of the Andes In effect, the Cordillera, as the Andes are often called by geographers, is a continuation of the Rockies; along and across it lie five of the ten republics into which, with the addition of the three colonies in Guiana, the South American continent is divided.

With a territory calculated to be approximately 352,143 square miles, Venezuela is the sixth in size of the republics. In the west it is mountainous: the Cordillera de Merida is the local extension of the Andes.

To the north of the chain is a lowland region about Lake Maracaibo. To the east stretch for hundreds of miles the grass-covered plains called the llanos of the Orinoco, cut up by the river and its tributaries into tablelands called mesas. Then to the east is the beginning of the Guiana Highland. Temperature tends to be high, except in the upper altitudes; rainfall is heavy.

The coastal districts and the lower mountain slopes are tropical; products include cacao, sugar, and tobacco. Higher up, in the subtropical highlands, coffee is the staple crop, and it is the chief agricultural export. The llanos are suitable for stock-raising, though the quality of the pasture is not first-class. Here are the greater number of Venezuela's 5,500,000 cattle

The mineral wealth of the country is reputed to be vast, but with the exception of petroleum and iron ore it has been little exploited. As a petroleum producer Venezuela takes second place, after the U.S A, it furnishes about 15 per cent. of the world's production. The chief wells are in the Maracaibo region and in the

eastern districts. Most of the oil goes for refining to the Dutch islands of Aruba and Curaçao, in the Caribbean, off the Venezuelan coast ; about one-fifth of the output is refined locally.

Venezuela is a United States, a federal republic of 20 states, of which Bolivar is the largest The population is 5,000,000, and most of the people are congregated in the lower part of the sub-tropical region. Caracas, the capital, has a population of 735,000, Maracaibo about 260,000

Colombia

Larger than Venezuela—its area is estimated at 440,000 square miles—Colombia has a coastline 2,000 miles long, almost equally distributed between the Pacific and the Caribbean. The population in 1951 was estimated at 11·6 million, the bulk of whom live in the sub-tropical and warm temperate regions at altitudes of three to nine thousand feet above sea level Bogota, the capital, is 8,700 ft. up ; its population in 1951 was 640,000 Next come Medellin, Barranquilla, Manizales, Cali, and Cartagena.

SOUTH AMERICA : the southern states.

The western half of Colombia is covered by the Andes Rainfall is heavy, and in the lower regions coffee, rice, tobacco, cotton, bananas, and cocoa are chief products. Rubber trees grow wild in the extensive forests, and there are huge quantities of timber and mineral resources, as yet hardly touched. Industries are in the primitive stage.

Ecuador

Ecuador's triangle covers an area of some 106,000 square miles, excluding "Oriente Province." But the frontiers of the republic have never been properly settled and the area may be anything between 106,000 and 273,000 square miles The 1950 census showed a population of rather more than 3,000,000. Over half were mixed, a quarter were Indian ; the whites numbered only 8 per cent., Negroes and mulattoes accounted for the balance. Quito, the capital, has some 211,500 people, Guayaquil 262,600.

Along the coast and in the lower river valleys tropical farming is carried on, and cocoa is the staple crop. In the hill country and the mountain valleys there are cattle ranches, dairy farms, and farms producing mixed crops. Some coffee is produced, and also tobacco. Gold and silver are worked, and there are oil wells in the Santa Eleana peninsula in Guayaquil. For the rest, Ecuador is a vast forest, rich in timber but hardly explored, let alone developed

Bolivia

Stretching from the eastern slopes of the Andes, Bolivia is completely land-locked—a feature that it shares with Paraguay among South American states. Its area is about 415,000 square miles Its population is only 3,750,000 (Amerindians and "mixed" account for over 80 per cent) Bolivia is the Indian republic *par excellence.* Sucre is the nominal capital, but La Paz is the actual seat of government ; their respective populations are 30,000 and 300,000. La Paz is 12,000 ft. above sea-level—the highest modern city in the world. Cochabamba is the second most populated city in the state. Potosi, once world-famous for its silver mines, has some 40,000 people.

The frontier with Peru crosses Lake Titicaca and the broken country north of the lake. On the north and east are tropical forests, only partly explored. The boundary with Brazil is formed of big rivers flowing north to the Amazon or south to the Plate. On the south the Pilcomayo river forms part of the boundary with Argentina.

Between Bolivia and Paraguay is the Gran Chaco (great hunting-ground), a vast area of

dense tropical forest, swamp, and desert. In spite of being virtually uninhabited and largely unexplored, this was the *casus belli* of the war of 1932-35 between Bolivia and Paraguay, in which Bolivia was vanquished and forced as a result to cede some territory.

Western Bolivia is occupied by the "altiplano," a high plateau edged by the ranges of the Cordillera and comprising two-fifths of the country. It is a harsh, inhospitable region, almost treeless and with many a sandy waste. La Paz is in the heart of magnificent mountains, of which the highest are Illampu (Sorata), Sajama, and Illimani, all over 21,000 feet. To the east of the Cordillera the ground descends to wide river valleys in the north, draining into the Amazon, and rolling grassy pampas.

Tin is Bolivia's principal export: it occurs along the eastern edge of the plateau from Lake Titicaca southwards. Bolivia ranks next to Malaya in the list of tin-producing countries and supplies about one-fifth of the world total. The principal mines have been acquired by the government. Bismuth is mined in La Paz and Potosi; also tin in the latter. Bolivia is one of the world's principal producers of antimony. In the south are oilfields. Because Bolivia has no sea coast she has to depend on the Peruvian port of Mollendo and the Chilean ports of Arica and Antofagasta, all linked by rail with La Paz.

Peru

Third in size of the South American states—its area is 533,000 square miles—Peru has a population of some 8·4 millions. About half are white, the remainder Indians for the most part. Along the coast there stretches for 1,400 miles a belt of lowland, usually much less than a hundred miles wide. Little or no rain falls, but where irrigation can be managed in the river valleys tropical and sub-tropical produce can be grown. Coffee, cocoa, and sugar are chief crops. Maize, rice, wines, and tobacco are also produced, mainly for home consumption.

Above the coastal region is the Andine zone, where on the western slopes of the Cordillera cereals are cultivated. On the tablelands, above 13,000 feet, cattle, sheep, alpacas, and llamas are raised. It is in this Andine region that most of Peru's minerals are worked: gold, silver, copper, quicksilver, lead, zinc, and iron.

Beyond, on the eastern slopes of the Cordillera, is the Montana, consisting of vast open valleys of rich pastureland and huge areas of forest. Lima, the capital, has some 533,600 people; its port is Callao (84,000). Arequipa, Cuzco (ancient capital of the Incas), and Iquitos are the next largest towns.

Chile

Last of the Cordilleran states is Chile. It extends along the west coast for 2,800 miles, with a breadth varying from 65 to 185 miles, and its area is 290,000 square miles. North of latitude 30° S. the country is largely desert; there is next to no rainfall, and few rivers reach the sea. All the same, this arid area is the scene of considerable economic activity: the Atacama Desert contains vast deposits of nitrate of soda which for years were the world's only source of a valuable fertilizer.

Synthetic fertilizers have deprived Chile of its monopoly, but nitrate of soda is still an important article of export, and the tax on it provides a large proportion of the national budget. A by-product of the nitrate works is iodine, and Chile produces about two-thirds of the world supply.

South of the Northern Desert is a semi-desert region rich in minerals, particularly copper. Copper alone accounts for more than half of the value of Chile's exports; output is surpassed only by that of the U.S.A. Where irrigation is possible, the semi-desert region is given over to agriculture.

Then comes Central Chile, consisting of a vast central valley between the coastal ranges and the main ranges of the Cordillera. South of lat. 42° S. the valley is submerged, but its line is continued in a series of islands. Central Chile is the principal agricultural area; there is some rain, and the Andean streams and rivers are numerous. In the valleys wheat, vines, and fruits flourish.

Around Santiago (the capital) and Valparaiso (chief port) is Chile's principal industrial area, based on water power, and on coal obtained from the province of Concepcion. Here most of the Chilean population of some 5,900,000 live and work.

Southern Chile lies in the belt of westerly winds and has abundant rain. The mountains are covered with thick forests, and in the valleys sheep and cattle are pastured. Wool and mutton is exported from Valdivia, and from Magallanes (Punta Arenas) on the Strait of Magellan, which is the most southerly town in the world. There is an oilfield in Chilean Tierra del Fuego.

LESSON 29

Brazil: Largest State of South America

Nearly half of South America is contained within the borders of the federal republic of Brazil. The republic is larger than the U.S.A. without Alaska. It is nearly 27 times the size of the British Isles. It is the world's fourth largest country, exceeded in size only by the U.S.S.R., China, and Canada. Its borders touch every South American state except for Chile and Ecuador.

From north to south its greatest extent is over 2,685 miles, from east to west even more. Its 3,289,440 square miles comprise the whole of Portuguese-speaking South America and correspond roughly to the whole of Spanish South America; it has a population of over 52 millions.

It is a political unity, in that its 20 states are a federation. But it is not a geographical or physical unity, in spite of the fact that the greater part of its huge bulk can be said to be the basin of the Amazon, largest of the world's rivers in drainage area.

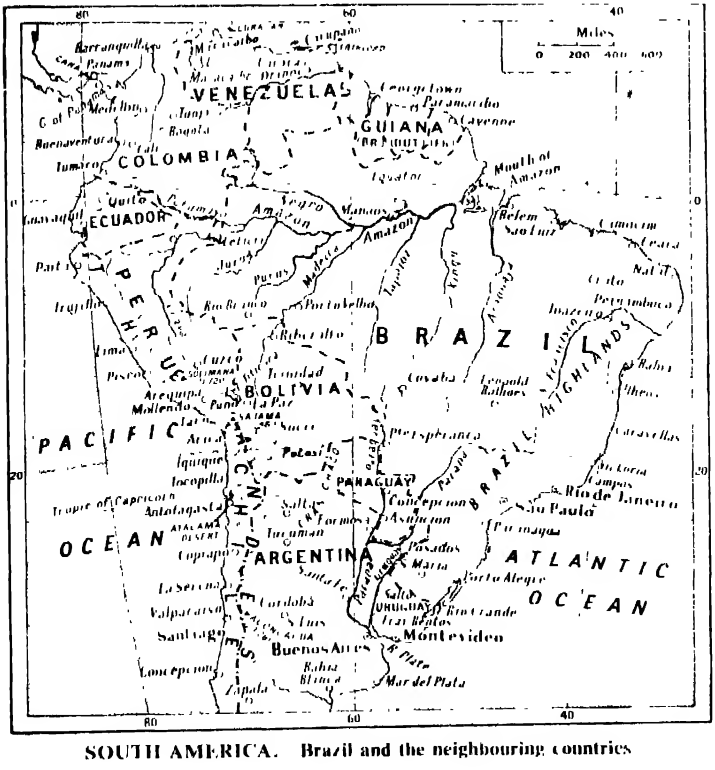
For 2,300 miles the main stream of the Amazon flows through Brazilian territory, moving eastwards through the region of equatorial heat. The river's ten chief tributaries all surpass the general run of European rivers, and there are some 200 which contribute their waters to the mighty stream that empties into the North Atlantic by numerous mouths. Most of the basin is dense forest, intersected by streams, creeks, lagoons, swamps, and branches of the great river and its affluents.

The forest is almost impenetrable: streams are traversed by the canoes of wild-rubber gatherers. The larger rivers are navigable, inviting travel, settlement, and trade. The Amazon itself may be regarded as a branch of the Atlantic; ocean steamers of considerable size can ascend more than 1,000 miles from the sea to Manaos, the river port at the confluence of the Amazon and the Negro. Smaller steamers can go up stream into Peru.

Only on the fringes and in the clearings is agriculture possible. Wild rubber is collected, and there are plantations in the northern states. Manaos is the collection point for the forest rubber, and Belem (Para) is the port from which it is sent abroad, chiefly to the U.S.A., but rubber exports are now small. The forest is immensely rich in timber, yet Manaos and Belem have imported large quantities because the local wood is exceedingly hard, and dense undergrowth and lack of labour make it difficult to secure. Most of the timber comes from the pine woods of the Rio Parana, pine timber ranking fourth among the exports.

In the north the Atlantic margin is broad and intersected by a number of large rivers as they make their way to the sea. The whole of this margin is a tropical region, where cotton, sugar, and cacao are produced.

South of Cape San Roque, at the tip of the "bulge," the plain starts to narrow, the slope from the plateau is steeper, and the rivers are shorter. Tropical conditions with heavy rain prevail in the lowlands. On the uplands it is somewhat cooler, permitting the cultivation of



SOUTH AMERICA. Brazil and the neighbouring countries

coffee. Bahia has the largest output of cocoa; Brazil is second only to the Gold Coast (British West Africa) as a producer of this commodity. Sugar-cane and tobacco flourish in the warm moist plains about Recife (Pernambuco). Rio de Janeiro, the capital (pop. 2,550,000 in 1950), is the centre of considerable industrial activity.

Extending south-east and south of the Amazon valley are the far-stretching plains of the plateau, divided into separate upland regions by rivers flowing north to the Amazon and south to the Parana. These vary widely, some being almost desert-land, others having alternating stretches of forest and lush herbage.

On the whole this is an area inviting settlement by the white man, but it is still largely unpeopled. The huge state of Matto Grosso, for instance, has less than one person per square mile. The mineral wealth is reputed to be vast, and in Minas Geraes there are immense deposits of iron ore.

São Paulo

São Paulo is Brazil's "leader state," and the city of São Paulo is Brazil's greatest industrial centre. In 1950 it had 2,228,000 inhabitants, making it the third largest city in Latin America (after Rio de Janeiro and Buenos Aires). The state is the richest and best developed in the Brazilian union, producing over half the country's industrial goods -30 per cent. of the cotton factories are in the state and paying well over half the federal taxes. Brazil produces normally much more than half the world's total supply of coffee, and São Paulo is the chief coffee-producing state.

South of São Paulo is a temperate region covered in the north and east with forest, in south and west with grassland suitable for cattle. Stock-raising is a flourishing industry, and agriculture is carried on in the forest clearings.

East of Venezuela and north of Brazil, on the shores of the Caribbean Sea, are British, Dutch, and French Guiana—the only portions of the mainland of South America remaining as possessions of European powers. All three have much in common. Along the littoral is a wide margin of alluvial land, rich and humid, varying in width from ten to fifty miles. Behind it foothills and terraces a few hundred feet high form a series of grasslands, the famous savannas of Guiana.

Beyond are wild and broken regions, mountain masses with an average elevation of some 3,500 feet and rising to peaks of eight or nine thousand feet. None of the rivers is navigable for more than a short distance. As they pour from their mountain fastnesses they plunge over waterfalls; the most impressive are the Falls of Kaieteur on the Potaro river in British Guiana.

The Guianas

British Guiana is the largest of the three, with an area of about 83,000 square miles (nearly the size of Great Britain) and a population of approximately 400,000. Georgetown is the capital (pop. 85,000). As in all the Guianas, most of the people are dwellers in the coastal belt, where they produce sugar-cane, rice, coffee, cocoa, and other tropical crops. Gold and bauxite are mined, the latter constituting a valuable export.

Dutch Guiana, or Surinam, is some 55,000 square miles in extent, population 219,000. Paramaribo, the capital, has 78,000 inhabitants.

French Guiana has an area of about 35,000 square miles, with 37,000 people, of whom 12,000 live in Cayenne, the chief town. The French penal settlement at Cayenne was established in the middle of the 19th century. The notorious Devil's Island, 27 miles off the coast, is no longer used as a penal settlement.

LESSON 30

Countries of the River Plate

The name "River Plate" was once applied to all that part of Spanish America that lay between the Andes and the Atlantic and derived a certain unity from the vast water system of the rivers Paraná, Paraguay, and Uruguay, whose united streams form the estuary of the Plate.

To-day that immense area is divided between three republics: Argentina, Uruguay, and Paraguay. Argentina, the largest of the three, and one of the most important and perhaps the most progressive of all the South American countries, has extended its bounds many hundreds of miles beyond that area. But the basin drained by the affluents of the Rio de la Plata constitutes an economic and a physical if not a political unity.

Argentina

The Argentine republic covers an area of 1,112,743 square miles, or a little less than a sixth of the whole continent of South America. Its estimated population in 1952 was 18,246,500. Politically it is divided into 16 provinces, 8 territories, and the Federal District of Buenos Aires (the capital, largest city in the southern hemisphere, pop. 3,403,625).

In the north is forest area intermingled with

grassland and swamp, extending across the frontiers into the Gran Chaco. It is rich in timber, and in many parts it is suitable for stock-raising. Indian tribes are virtually the only inhabitants.

In the sub-Andine region, in the hilly country of Tucuman, there is a prosperous sugar district. Mendoza is the centre of a land of vineyards. Tucuman has some 210,430 people, Mendoza 109,400.

The Pampas

From the low, flat shore of the River Plate the vast grass-covered plains (the pampas) stretch for several hundred miles north and west and south. For long they were roamed over only by Indian tribes ; in the 19th century there followed the period of the gaucho, the mounted cowboy, who tended herds of cattle on unenclosed lands. Then came the age of fenced estates, of machinery and *estancia* houses, of railways and refrigerators, of beef by the million tons and in billions of tins.

The climate is congenial to European settlers, and the best agricultural lands are within easy reach of the Plate, which constitutes a great natural highway reaching far up into the heart of the country. To-day this region is the core of Argentina, with two-thirds of the population and most of the big industrial plants.

Meat and Grain

Wheat and maize are grown in huge quantities for export to all the world and the government elevators at the ports are of tremendous capacity. But it is still for meat rather than grain that the pampas is remarkable. Argentina has 43 million cattle ; and three-quarters of these, it is estimated, are pastured on the pampas where weather conditions are such that the cattle can be left out in the open the year round. Great attention is paid to breeding, and many prize animals have been imported from Britain with a view to improving the native strains.

Vast sums - derived very largely from British investors have been sunk in the country's principal industry, meat refrigeration. In 1950 the whole of the livestock industry, from ranch to refrigerator, was placed under state control. Buenos Aires has the largest refrigerating plant in the world, and in addition to its cattle there are millions of sheep for freezing, chilling, or canning. Much of the meat goes to Britain. Rosario with 761,000 people and Cordoba with 352,000 are the chief pampas cities.

Beyond the pampas lies a country of thorn scrub which passes gradually into the sub-Andine region, one of poor steppe or semi-desert. Where irrigation is possible cereals are grown, and the country tends to become farmland rather than grazing-ground.

South of the Rio Negro is Patagonia, which includes the Argentinian territories of Rio Negro, Chubut, Santa Cruz, and Tierra del Fuego. The last is separated from the main body of the Argentine by a strip of Chilean territory enclosing the Strait of Magellan. On the steppe great numbers of sheep are pastured. Sheep farming is also the principal occupation of the inhabitants of the British Falkland Islands some 400 miles from the coast of Patagonia. (The Falklands have an area of 4,618 square miles, with a population of 2,230 ; the chief town is Stanley, pop. 1,200).

Uruguay

The smallest of the South American republics is Uruguay. Its 72,000 square miles are almost ringed with water 120 miles of coast-line on the Atlantic and 600 miles of riverine frontage on the Rio de la Plata and the Uruguay river. Virtually the whole of Uruguay consists of alluvial plains and valleys, an unbroken spread of green shading into mauve-blue hills. Sixty per cent. is given over to stock-raising, 20 per cent. to mixed farms and ranches, 7½ per cent to agriculture proper , the remainder is unproductive or undeveloped

As in the Argentine, meat is the basis of Uruguay's economy. The livestock consists of over 8 million cattle and 23 million sheep. Vast numbers are slaughtered at the "frigorificos" every year and converted into chilled, frozen, or tinned beef and frozen mutton Britain, U.S.A., and Brazil are Uruguay's best customers

Uruguay's population is estimated at 3,000,000, of whom more than a quarter 802,500- are inhabitants of the capital city, Montevideo, on the estuary of the Plate, considerably nearer to the open sea than Buenos Aires on the opposite bank. The second city in the republic is Paysandu (50,000), which with Fray Bentos, also on the banks of the Uruguay, is world-famous for corned beef. Salto (37,000) is the limit of navigation on the same river.

Paraguay

Paraguay, like Bolivia, has no sea coast. Its area of 157,000 square miles is ringed by the Argentine, Bolivia, and Brazil. Its people number 1,600,000, including the Indians of the Chaco Asuncion, the capital, has a population of 205,000, or an eighth of the whole.

The country is divided into two distinct sections : Eastern or Old Paraguay, enclosed between the Upper Paraná and the Paraguay rivers and the Paraguayan Chaco lying across the Paraguay. Much the more important is the first, because it contains virtually all the towns and the great majority of the people.

The climate has been described as three months of summer and nine months of spring. Rainfall is sufficient; and though much of the country is forest, large tracts of grass provide pasture through the year for some $3\frac{1}{2}$ million cattle and 500,000 sheep, pigs, and goats. Cattle-raising is the principal occupation. Very different is Western Paraguay, much of whose surface is forest, jungle, or swamp. Quebracho trees, from which tannin is obtained, abound in the forests. In the grassy areas cattle are pastured, and cotton is grown.

LESSON 31

The World's Polar Extremities

THE top and the bottom of the world are the polar areas. The top, or north, is the Arctic Ocean. The bottom, or south, is Antarctica, a continental land mass. If a circle be drawn slightly smaller than a sixpence, a concentric circle twice as far across, about the size of a penny, and the common centre be marked with a dot, then the dot is a pole, the inner circle is lat. 60°, and the outer circle is the Equator.

If the pole be 90° N., then within the smaller circle is the Arctic Ocean with its shorelands; between the circles lies the rest of the northern hemisphere, the home of virtually the whole of the world's people.

Within the smaller circle are a few utilities, chiefly on a small scale. In Spitsbergen (Svalbard) coal of excellent quality is mined. Based on the coal industry are permanent winter residents, settlements, wireless stations, and regular mail steamers. In Alaska, near Cape Lisburne, are coal and petroleum. Klondike and Dawson, in Yukon, lie within the circle. On the west coast of Alaska, Nome has gold veins in the low hills and gold in the gravel of the streams. In addition to minerals Alaska produces commercially furs, salmon, and timber.

Sea and Land Animals

Just outside the smaller circle, in the Bering Sea, are the Pribilof and Commander Islands, respectively belonging to the U.S.A. and to the U.S.S.R. They are the two chief rookeries of the fur-bearing seal. Elsewhere in the Arctic the seal is a source of fat and clothing for the local inhabitants; it is the chief game animal, in the sea, of the Eskimo. The whale has almost disappeared from the Arctic; whalers have now transferred their activities to Antarctic waters.

The land animals are the musk ox, caribou, reindeer, bear, and Arctic fox. The musk ox is dying out and is of much less use to the natives than the reindeer. The caribou is the chief game animal of the Eskimo on the land. The Eskimo plans his life and movements so as to be able to hunt the caribou on its routes of migration from the uplands, which it frequents in the summer, to the lower lands, its winter home. Antarctica has whales off its shores and penguins on the coast; it lacks quadrupeds.

Lands of the Midnight Sun

The polar areas include all the lands of the midnight sun. At lat. $66\frac{1}{2}$° on midsummer day the sun does not set but is continuously above the horizon for almost 72 hours. As the latitude increases, the period of continuous sunlight increases; at 70° it is two months, at 80° four months, at 90° six months. About midwinter continuous lack of sunlight endures for similar periods.

The daily range of temperature during the continuous sunlight tends to be small. The period of continuous lack of sunlight is incorrectly labelled the period of darkness—incorrectly because there are periods of moonlight. The continuous lack of insolation (exposure to the sun's rays) tends to a steadiness of daily temperature.

It happens, therefore, that winter conditions are often more favourable for human beings and their movement than summer conditions. In summer the melted ice limits travel, and mosquitoes and other insects swarm abundantly. In summer, wherever soil appears, plant life appears also, and there is the grass tundra for the musk ox and the lichen tundra for the reindeer and caribou.

The dominant climatic factor is, however, not the sun but the permanent load of ice, either on the land, as in Antarctica and Greenland, or on the sea, as in the Arctic. Taking the year as a whole, the polar regions are the coldest places in the world, for though it is probable that the maximum pole of cold occurs in Siberia, outside the Arctic, at Verkoyansk, in the north of the Yakutsk republic, where the mean January temperature is −49° F. (81° of frost), and the mean July temperature 70° F., a range of nearly 120 degrees—yet this great cold is confined to the winter, and the yearly mean in Siberia is not as low as in Antarctica.

Climatic variations depend next upon the ocean currents and the character of the ocean currents. The Gulf Stream drift of the North Atlantic keeps Northern Europe ice-free in summer, while lower latitudes off East Green-

land are infested with drift ice. If the sea ice does not melt, then the climatic effect, both direct and indirect, of the warmer sea waters is negligible ; although the ice south of the Ross Sea in Antarctica is partly afloat, and partly anchored on the continental shelf, it is climatically part of the continent.

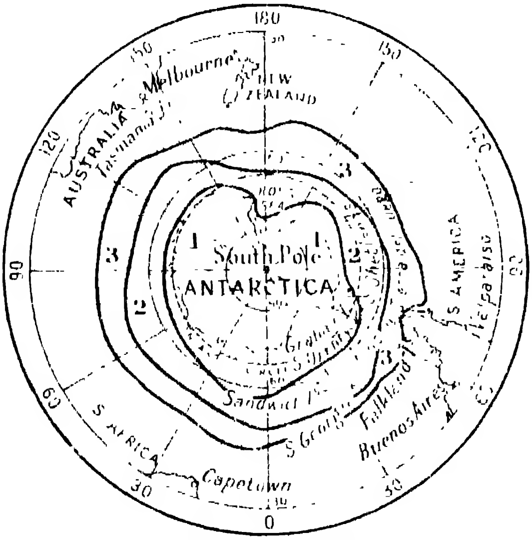
When extensive patches of land are free from ice and snow in the summer, the climate tends to continental extremes, which may be modified by the nearness of ice-free waters and thus become a modified maritime climate. Where ice persists, the air is dry : there is no cloud blanket ; winds tend to move more rapidly and freely.

Walking against a blizzard is possible only with crampons (iron shoe-spikes to grapple the frozen ground), and with the body almost horizontal in the teeth of the snow-filled whirl. The edge of a blizzard is often clear-cut, for a man may stand unaffected and see, two yards away, men blown down and heavy articles spun like feathers. In the north, where ice and water meet more frequently, the air is moisture-laden and the bugbear is not the blizzard but fog—fog in summer.

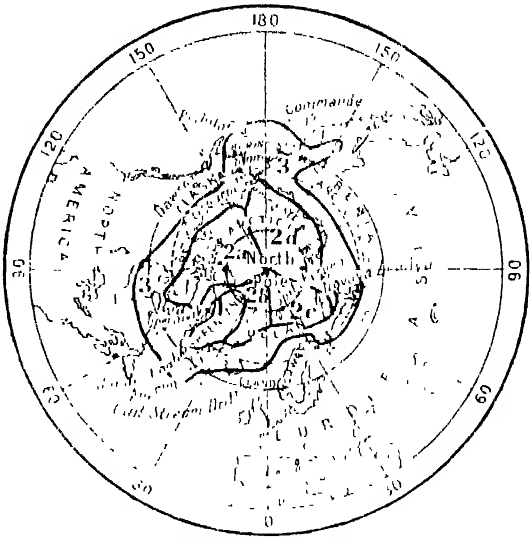
Main Polar Regions

The polar areas are not uniform. Three main regions are defined : (1) where the warmest month has a mean temperature of 32° F., freezing point ; (2) where the warmest month lies between 32° and 41° F. ; (3) where the warmest month lies between 41° and 50° F.

In the south the first region includes Antarctica, its edge marked roughly as the mean limit of drift ice ; the second includes the S. Shetlands,



ANTARCTIC REGIONS. Figures are explained in the text.



ARCTIC REGIONS. Figures and letters are explained in the text.

S. Orkneys, S. Georgia, and the Sandwich Is. ; the third includes Tierra del Fuego and crosses the Falkland Is., although it is suggested that these areas should not be included in the true polar areas ; the boundary of the third region is roughly 50° S.

In the north region the first is inland Greenland, the second includes the rest of the Arctic islands, except the coast of southern Greenland, which is in the third, which also includes the littoral of the Arctic Ocean (except Norway) and the southern half of Iceland. Region two is subdivided into four : (a) the Canadian islands ; (b) the Greenland northern shores ; (c) Spitsbergen and Novaya Zemlya ; (d) the Asiatic quadrant.

Greenland

Typical of all three major regions is Greenland, one of the largest of islands. It covers some 840,000 square miles, stretches 1,650 miles from north to south, and is about 800 miles across at its widest.

Inland is an upland dome of ice about $1\frac{1}{2}$ miles above sea-level ; the periphery begins at the edge of the inland ice and is a transition area penetrated by arms from the sea and by ice tongues from the interior. Inland (region one) the ice is continuous except in the south-east and north-west, where rock appears above the ice surface. The coast is in general ice-free except for a long stretch along Melville Bay on the west, and south of Angmagsalik on the east.

Since 1953 Greenland has been part of the kingdom of Denmark (it was formerly a colony). The population is about 24,000, chiefly Eskimo. Greenlanders, the only pure Eskimos, are isolated at Etah and Angmagsalik. The winter

settlements are of primitive low stone and turf houses ; in summer the people camp on their seasonal hunts. Tobacco, coffee, Eskimo newspapers betoken the influence of the white.

The kayak is the vehicle for water transport and fishing, the dog sledge for hunting ; fjord seal are hunted in region three from the kayak, in region two from the ice. Closest settlement occurs in the south, near Julianehaab, where garden cultivation is possible.

North-East and North-West Passages

The Arctic was long thought impracticable for the world's shipping, but Soviet navigators proved that both the north-east passage and the north-west passage could be made. The north-east passage almost follows the shortest distance from London to Japan ; this distance along one of the world's great circles is almost a straight line when drawn on the map ; from London it skirts the west of Norway, crosses Novaya Zemlya, and skirts the Japanese islands.

The north-west passage through Baffin Bay to Bering Strait is more tortuous, for the land intervenes. A circle from the Great Lakes of Canada to Britain roughly marks the sea route from the English Channel to Hudson Bay ; a circle from Lake Superior to the Caspian Sea crosses Greenland, skirts the North Cape, and crosses the White Sea, a simple curve on the polar map. The Arctic was first criss-crossed by airways in the Second World War.

LESSON 32

The African Continent

AFRICA is in some respects a symmetrical continent ; it lies evenly athwart the Equator. Cairo is 30° N., Durban is 30° S.; the northern portion is roughly bisected by 10° E., Gambia is 15° W., Eritrea 35° E. It is the largest land mass except Asia.

Physically, the south is an elevated plateau, most of which lies between half a mile and a mile above sea level. Here, on the west, there is little coastal fringe or continental shelf, the plateau edge ends sharply near the sea. In the east the shelf is also narrow, but Mozambique is almost entirely a coastal lowland.

In the south-east of the continent the Drakensberg Mts. present a scarp face to the Indian Ocean in Natal and Swaziland ; from their western slopes the Vaal-Orange flows west to the Atlantic, while the Limpopo curves round their northern edge to the swampy eastern lowlands. The north-west section of the plateau is drained by the tributaries of the Zambezi.

The Great Rift Valley

North-east beyond the river and Lake Nyasa begins the great Rift Valley. The rift occurs on the western side of the elevated eastern portion of Equatorial Africa, where peaks rise to a height exceeding 2½ miles ; these include those of the mountain range Ruwenzori (some peaks over 16,000 ft.), and Kilimanjaro (19,300 ft.).

Here, crossed by the Equator, is Lake Victoria (Victoria Nyanza), filling a shallow plateau depression as one of the world's largest sheets of fresh water ; from it issues the White Nile.

In Western Equatorial Africa, a square roughly 15° each way, is the Congo basin. The north-west corner of the square is mountainous and culminates in Cameroon Mt. (13,400 ft.). A gentle tableland connects these heights with the Uganda plateau and forms the northern edge of the basin. The sweep of the riverine waters curves round three sides of the square.

Coastal Rivers

Northern Africa has in the north-west the Atlas Mts., which belong to the Eurasian east-west fold mountain system ; they are, strictly, not African. In the south-east the continuation of the central heights is mountainous Ethiopia (Abyssinia), with an arm to Cape Guardafui, across the intervening area and joining them is a height of land through Tibesti and Ahaggar. The rest of the north is a low plateau, reaching a coastal lowland in Tripoli and in Senegal, with isolated lower elevations in northern Nigeria and French Guinea.

South-west are the minor coastal rivers, such as the Senegal, Gambia, and Volta, and the greater Niger-Benue. The Niger rises near Sierra Leone, curves with a mighty sweep past Timbuktu, and enters the sea at the other end of the Gulf of Guinea. North-east from the Benue is the Chad basin, drained by the Shari, one of the great basins of internal drainage.

The Nile

The Nile is the chief feature of the eastern section. Normally a river has three sections : the mountain section of steep slopes and rapid flow, and valley tributaries ; the middle section ; and the plain section near the mouth, where the slope is a minimum and the tributaries are sluggish.

The Nile has these three normal features upstream from the cataracts ; the normal mouth should occur south of Wadi Halfa, but the lower Nile is unique. Without tributaries, the river flows in a ten-mile or so wide trench ; it is harnessed and controlled, and is little other

than a water-bringing channel for a desert land. The real river comprises the system of the main stream, the White Nile; the chief tributaries, the Sobat, the Blue Nile, and the Atbara—all three from the mountains of Abyssinia; and the occasional tributary, the Bahr el Ghazal, from the desert on the west.

Floods and Dams

The annual phenomenon of the all-important Nile flood is due to two causes: first, the character of the heavy early summer rains on the Abyssinian mountains which flood the valleys of the three tributaries, particularly of the Blue Nile, owing to the large run-off of water from the mountains; secondly, the character of the valleys themselves, for they tend to be deep gorges with narrow sides, because lateral erosion of the river bank is at a minimum.

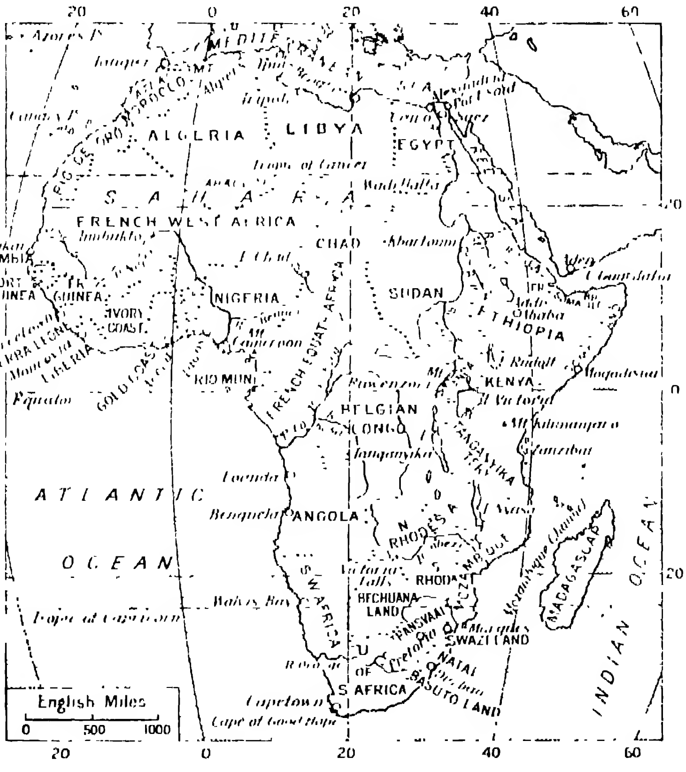
The floods dam the White Nile at Khartoum. The White Nile flow tends to be normally river-like, as the water supply comes from the constant equatorial rains of the Lake Victoria area, and the lake itself tends to act as a regulator to the outflow.

When the White Nile is dammed, the lowland areas, where the river is known locally as the Bahr-el-Jebel, are flooded and marshy. The Nile, Niger, and Zambezi have deltaic outlets.

Winter Rains, Summer Drought

Climatically, the symmetry of African conditions is unique. The high-pressure belts occur both north and south. As the world tilts seasonally on its axis relative to the sun, to bring in turn the so-called summer and winter seasons, the main axis of the belt swings laggardly to the north or south in sympathy with the tilt. For this reason the north, or Mediterranean, coast in July and the south, or Cape, coast in January, lie within the belt.

The consequent aridity, cloudlessness, and brilliant sunshine of the anticyclonic conditions in these summer months, coupled with the inevitable rain of the cool season, are characteristic of these areas of winter rains and summer drought. Between the high pressures is the equatorial low pressure with the laggard winds and the rising air; this means convectional rains, especially when insolation is high, and the equatorial area has constant rains while the edges near the tropics have summer rains.



AFRICA general map of the continent. More detailed maps of various areas are in the subsequent pages.

Normally, the water for the rain should come inland from the Indian Ocean, borne by the trade winds; the spinning world should spin into a wet, hot, steamy, clammy atmosphere. But the Indian Ocean is not normal in summer, for the winds there become monsoons in summer and the south-east trades tend to swirl away from Africa towards India; also, the eastern heights tend to condense the moisture on the coastal lowland.

Madagascar is narrow enough to have extensive summer rain throughout, but the continent has its summer rain heaviest inland from the coast on the inland side of the heights. These rains in Abyssinia provide the Nile flood-water, and in the south provide water for the upper Congo and the upper Zambezi.

On the west the water supply comes from the Gulf of Guinea, and the Guinea Coast has heavy summer rains. The sequence from

north to south (or south to north)—winter rains, no rains, summer rains, constant rains, summer rains, no rains, winter rains—is symmetrical.

The two no-rain areas are the Sahara and the Kalahari deserts. Snow falls on the heights even on Cameroon Mt., and lies on Kilimanjaro; but the snow rarely endures for long, even on the Atlas, and there are no snow-fed rivers such as the Ganges or Indus.

Effect of Elevation

The natural vegetation is Mediterranean with the winter rains, hence Cape and Algerian wines; it is summer rain grassland, not prairie-like, for there are no winter frosts, but savanna-like or parkland; hot wet forests occur with the constant rains. The effect of elevation is important, because the predominant plateau of the south limits the size of the Kalahari and allows the veld, summer grassland, to extend far south to the Transvaal, 500 miles farther from the Equator than in Sudan.

The interfluvial uplands of the Congo basin are open parkland similar to the Brazil uplands, but the Congo forest is not nearly so extensive as the Amazon forest; it lies entirely west of the rift valley.

The canal of the lower Nile is lined by a population similar in density to that of the Low Countries in Europe. Elsewhere the people are scattered, with the greatest density in a zone which stretches from the Gulf of Gambia round the Gulf of Guinea and across to Mozambique. Here the people are Sudan or Bantu Negroes.

Raw Materials

The whites or Indo-Europeans are few in number, widely scattered in the extreme north-west and in the south. In the north they represent attempts at colonisation from Spain, France, and Italy; in the south they are descendants from Dutch or British colonists, or a conglomerate of exploiters of mineral wealth. About half as many people as there are in India are spread over the African continent. They supply the world with primary products, the most valuable of which are minerals.

The white man has invested much capital in this continent. The railways are ambitious in conception. Orange groves, rubber plantations, cotton fields served by waters from expensive Nile dams and barrages, all are efforts to produce raw materials, etc., required to supply Western industrialism.

LESSON 33

North-West Africa

North-west Africa includes virtually the whole of the western projection of the continent. Its eastern boundary is approximately 10° E., so that its east-west extent is roughly 25°, i.e. some 2,000 miles, and its width between the Gulf of Guinea and the Mediterranean Sea is 30°, i.e. some 2,000 miles.

Physically, the area has three sections: the north-west, where the Atlas mountains belong in geological time to Europe of the Alpine uplifts; the interior, slightly elevated plateau; and the coast of the south-west and south, where the waters are surf-disturbed, the shores are mangrove swamps, the littoral is an alluvial plain, and the interior rises to ranges between which the Volta and other smaller rivers flow southwards through the jungle forests.

Regions of Climatic Difference

The whole area is hot, except where temperature is moderated by elevation. The seasonal differences in temperature are greater in the north than in the south, but the seasonal character of the rainfall calls into existence four regions of climatic difference: the north, which is Mediterranean, and has winter rains and summer droughts, while snow is not unknown in the winter; the definite interior, which lacks rain always; the belt of summer rain and winter drought farther south; and the coastal fringe, which tends to experience constant equatorial rains of considerable magnitude.

The summer rains reach the latitude of Timbuktu on the bend of the Upper Niger; the northern winter rain area is much narrower and more dependent on the sea; south of the latitude of Biskra, in the Atlas, the area of no rains begins.

Consequently there are four belts of natural vegetation. The Gulf Coast is almost entirely equatorial, hot, wet, jungle, forest. The north coast has Mediterranean vegetation, marked by fruit-bearing trees (fig, nut, orange, lime, lemon) and drought-resisting plants. The summer rain belt is savanna or parkland, where first the trees and later the shrubs thin out towards Timbuktu, north of which is the true desert, the Sahara.

For long the Sahara was regarded as a barrier; but the Second World War saw the development of a vast network of road and rail communications which penetrate the Sahara and sweep through Equatorial Africa to link the west coast with Sudan. The U.S.A.-Middle East air route to-day links New York with Cairo via Natal (Brazil), crossing the Atlantic Narrows to Bathurst or Dakar.

The rainy areas of the south are the home of a

section of the black peoples, sometimes labelled Sudan Negroes, of whom Kru and Fulah are tribes. The people of the northern rainy area are a mixed populace; there the non-whites represent a relic of the Mussulman empire, which so disturbed medieval Spain. The interior is peopled by Tuaregs, Berbers, and Moors. Population density is nowhere very great; the coastal fringes and the Niger valley have the largest aggregates.

Spanish Possessions

The colonial possessions of Spain in Africa cover approximately 130,000 square miles in the north-west, including part of the waterless Sahara with a sparse population of wandering Muslim Arabs, with a population of 1,491,000. Rio de Oro, an Atlantic coastal strip about 73,362 square miles, is the principal zone of Spanish Sahara. The chief town is Villa Cisneros, but the colony is administered from the Canary Islands (Las Palmas and Santa Cruz de Teneriffe), which have busy fisheries. The chief town of Rio Muni, Spanish Guinea, on the mainland is Bata; the colony is administered from the island of Fernando Po.

In the French Union

What used to be called the Barbary States—Morocco, Algeria, and Tunis—are included within the French Union. Algeria contains some 847,500 square miles with a population of over 8¾ millions. In the Tell, the area between the crest of the Atlas mountains and the sea-shore, there are many farms where irrigation is possible, and such Mediterranean produce as vines and olives, dates and figs, flourishes.

In the forests there is valuable timber, but much of the land is not suitable for cultivation. Still more is this true of the high plateau and of the Saharan region south of the mountains. Here life is possible only in the oases, few and far between. Iron ore production and phosphates are important in northern Algeria.

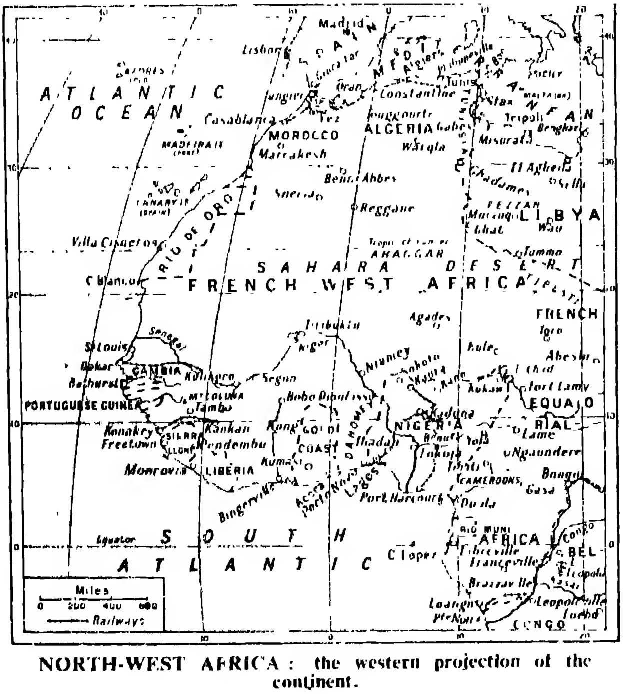
Tunisia

Tunisia is some 48,300 square miles in extent, with a population of 3,250,000. The capital city of Tunis has 364,600, Bizerta, the chief port and French naval base, 39,300. The fertile valleys in the north are specially suited for the cultivation of Mediterranean fruits. In the Sahel, the east coast region, olive groves abound. On the tableland of the centre sheep and goats are grazed. In oases and gardens of the south dates grow in profusion.

Morocco

Morocco as usually defined is about 170,000 square miles, divided between the French zone (150,000 sq. m.), the Spanish zone (7,600), and Tangier (135). The populations are approximately 8½ million, 1¼ million, and 110,000. In the French zone, Casablanca on the Atlantic coast is the largest city, with some 569,500 inhabitants. Marrakesh (239,000), Fez (202,000), Rabat (161,000), and Meknès (162,000) are other large towns. Tetuan, the largest centre of population in the Spanish zone, has 80,000 people.

On the coastal plains agriculture is carried on, typified by the production of barley, wheat, and maize. In districts near the towns where irrigation is possible oranges, olives, and figs are grown. On the tableland of the Meseta, in the south-west, pastoral pursuits are the rule; the rainfall is not to be relied upon for successful cultivation. The Atlas and the Saharan regions are peopled here and there in the valleys and oases, but only primitive husbandry and sheep-grazing are possible.



NORTH-WEST AFRICA: the western projection of the continent.

Libya

Libya lies between Tunisia and Egypt. It was incorporated in the Italian empire until it was overrun by British forces in the campaigns of 1940-1943. It contains three provinces, namely, Cyrenaica in the

east, bordering Egypt ; Tripolitania in the north-west, bordering Tunisia ; Fezzan in the south-west, bordering Algeria. The first came temporarily under British administration after the Second World War, and Fezzan under French administration ; later all three were combined on a federal basis with the amir of Cyrenaica as hereditary monarch of the whole (king of Libya).

Libya's area is estimated at about 680,000 square miles, its population at 1,150,000. Italian colonisation was especially active along the coast and over the tableland of Cyrenaica, the eastern part of Libya. Mediterranean fruits flourish in the lower districts. On the steppe, barley and wheat are grown and sheep and goats pastured.

Tripoli and Benghazi are the joint capitals of Libya. Tripoli is the largest town, with over 150,000 people ; Benghazi has 60,000. Misurata has 63,000. Homs and Derna are smaller towns. In the Sahara, far south, are oases linked by caravan routes.

Senegal

In West Africa the French Union includes Senegal, French Guinea, the Ivory Coast, Dahomey, French Sudan, Mauritania, Niger, and Upper Volta. Altogether this expanse comprises 1,805,000 square miles, with a population of some 16½ million, of whom 26,000 are white, most of the remainder being Negro.

Senegal, the premier colony of French West Africa, is mostly sandy desert, but rice, maize, and other tropical food crops are grown when the rivers Senegal and Gambia overflow their banks in floodtime. Groundnuts are the outstanding commercial product. St. Louis (63,000) is the capital ; near the mouth of the Senegal river, it is of little account as a port because of a shifting sand bar. Dakar, the seat of the governor-general of French West Africa, and a town of 175,000, is a well-equipped port and an important centre of air traffic.

French Guinea is a decidedly tropical area, producing palm-kernels and palm-oil, rice, tropical fruits, and wild rubber. Konakry is the capital and chief port.

The Ivory Coast

The Ivory Coast is the name given to the region between the independent Negro republic of Liberia and the British colony of the Gold Coast. In the south there are dense tropical forests ; savanna conditions prevail in the north, where a large population lives by cultivating rice, millet, and maize. Coffee, cocoa, palm-kernels, and palm-oil are important exports. The seat of administration is at Abidjan (46,000).

Dahomey, between the Gold Coast and Nigeria, comprises coastal forests and central savannas, merging in the north into scrub and desert. Palm-kernels and palm-oil are the chief products ; cotton is cultivated in the central area. Porto Novo (31,000) is the seat of government.

Pastoral Pursuits

French Sudan covers an enormous area of the Sahara (461,000 sq. miles), reaching to the southern border of Algeria. Bamako on the Upper Niger is the capital (85,000). There are smaller towns inhabited by native craftsmen and traders. Pastoral pursuits are widely followed, and in suitable regions rice, cereals, groundnuts, sisal, and cotton are cultivated.

Mauritania is a largely desert area to the north-east of Dakar. Population averages just over one to the square mile. Most of the country is roamed by nomad pastoral tribes in search of grazing and water for their flocks and herds.

French Niger is desert in the north, forested in the centre, wooded and grassland in the south. In this last region there is agricultural and pastoral activity. Groundnuts are exported in considerable quantity, and there is trade in cotton, gum arabic, dates, and salt. Niamey, on the Niger, is the capital ; it has an aerodrome.

Formerly German, the greater part of the Cameroons is under French trusteeship (a strip contiguous on Nigeria is under British trusteeship). Products are palm-oil, cocoa, bananas coffee, timber, hides, ivory. Douala is a fine deep-water port and the largest town (population 86,000). Yaoundé (40,000) is 2,000 feet above sea-level and is the capital.

British West Africa

In West Africa there is a not inconsiderable section of the British overseas empire. It comprises the dependencies of Nigeria, Gambia, Sierra Leone, and the Gold Coast. Of these the largest, in size and in population, is Nigeria, 372,000 square miles, population over 30 millions.

In the south of Nigeria the tropical evergreen forest predominates, and it is continued up the valley of the Niger. This zone yields timbers, including mahogany, and palm oil is one of the mainstays of the export trade. Cocoa is another major crop for export. Beyond this zone are the savanna lands, beyond these again undulating highlands, eventually falling away in great plains to the basin of Lake Chad.

In the forests Sudanese Negroes produce subsistence crops, together with palm-oil and palm-kernels which are the chief exports of the dependency. Cereals are the support of the occasionally dense population of the savanna ; cotton is grown as a commercial crop. Nigerian tin is of importance, the principal source being the Bauchi plateau. Ibadan is the largest town,

with about 500,000 inhabitants. The port of Lagos, the capital, has 267,000.

Gambia consists of several small islands in the river Gambia and a narrow strip of land bordering the river for some 200 miles up-country from its estuary. The total area, colony and protectorate, is rather more than 4,000 square miles, population about 250,000. Bathurst, the capital, stands on the island of St. Mary. It has an airfield at Yundum, 17 miles from the town, which links it with Dakar and Accra and so with London.

Sierra Leone

Sierra Leone is another enclave of British territory, wedged between French Guinea and Liberia. Its area, including the protectorate, is about 28,000 square miles, population 1,860,000. Freetown, the capital (64,500), is an important port of call; nuts, bananas, coffee, palm oil, chrome ore, diamonds, gold, etc., are despatched therefrom, and imports of cotton goods, etc., are received.

The Gold Coast

The colony of the Gold Coast, with Ashanti, the Northern Territories and that part of once-German Togoland for which Britain is trustee on behalf of the United Nations covers some 91,690 square miles, with 4½ million people. Part of Togoland is under French trusteeship. Accra, the chief Gold Coast town, has 135,000 people; Kumasi has 78,000. Most of the country is flat or undulating; the Gold Coast itself and the lower parts of Ashanti are covered with forests, the remainder being savanna country. Cocoa leads the list of products; other items are gold, manganese, diamonds, mahogany, palm-oil, copra, and rubber.

A big scheme of development on the Lower Volta river includes the building of a dam to form a reservoir as a source of hydro-electric power for the manufacture of aluminium from local bauxite, and to allow navigation nearly to the junction of the Black and White Voltas. A new port, Tema, has been constructed between Accra and the mouth of the Volta. At Takoradi, a town near Sekondi, with a joint population of 50,000, there is a modern deep-water harbour capable of accommodating the largest vessels engaged in the West African trade.

Liberia

The "black republic" of Liberia (43,000 square miles approx.; 1¾ million people) has been an independent state since 1846, but economically it can hardly be regarded as other than a colony of the U.S.A. The greatest industrial interest in the country is that of the Firestone Corporation, which, in return for a loan, received from the Liberian government a million acres of land on rental—land on which rubber plantations have been established, providing material for the tyres of American cars.

The great majority of the people are pure black, but in the south, particularly around Monrovia, the capital (pop. 20,000), are some 12,000 Americo-Liberians, i.e. descendants of liberated slaves from U.S.A., who formed the original state in the early 19th century. Airports and roads have been constructed by the U.S.A. and harbour works carried out at Monrovia on American lend-lease terms, introduced during the Second World War in connexion with the granting of Liberian air bases to the United States. Most of the country is scrub, jungle, or dense forest. Rubber is the most important of the exports.

LESSON 34

Egypt, the Nile Valley, and the Great Rift

One of the most conspicuous features of the map of East Africa is the number of its great lakes, some about as wide as they are long, lying in basins with gently sloping sides, others long and narrow, situated on the floor of deep troughs with high parallel cliffs.

The largest of the long, narrow, fjord-like lakes are Tanganyika, Nyasa, and Rudolf; they lie in two chains, which trend in general from north to south on either side of the Victoria Nyanza. The two chains are connected to the south at Lake Nyasa; one branch passes north-westward through lakes Rukwa and Tanganyika and continues northward through Lake Albert and along the valley of the Upper Nile.

The other or eastern chain leaves the northern end of Lake Nyasa and includes a number of small lakes such as Manyana, Magadi, Lake Naivasha, the three salt lakes of Elmentaita, Nakuru, and Hannington, and so on east of Victoria Nyanza through Lake Baringo to Lake Rudolf.

From the northern end of Lake Rudolf the valley continues along the Omo river, forming a trough-like depression between the highlands of Abyssinia and the plateau of Somaliland. The floor of the valley sinks northward to form the Red Sea, which repeats the shape of the East African lakes on a greater scale, for its floor is comparatively flat and its sides are precipitous.

The Red Sea forks at its northern end ; one branch passes west of Sinai as the Gulf of Suez and out into the Mediterranean, the other is continued into the deep depression of the Dead Sea—the deepest land surface on the face of the earth—and the valley of the Jordan up to the base of the Taurus mountains.

At the other end of the Great Rift Valley the basin of Lake Nyasa is continued south of the Zambezi by a valley across Mozambique to its end near Sofala. Altogether the Great Rift Valley is nearly 5,000 miles long, the longest land valley on the earth.

It was born of tremendous earth movements and immense volcanic activity in remote ages of geological time. And those movements are not yet finished. Earthquakes still occur frequently along the Great Rift, and its whole course is liable to be shaken by them.

Course of the Nile

In one of the great lakes, the Victoria Nyanza, the Nile has its origin. Emerging from the lake's northern shore it proceeds on its 3,526-mile course to the Mediterranean. From the northern extremity of Lake Albert it runs northwards. At Rejaf, 15 miles south of Gondokoro, it enters the region of the plains and continues thence to Khartum, nearly 1,100 miles to the north, where the waters of the Blue Nile mingle with those of the main stream.

Flowing through the Nubian desert the river makes two great bends, and between Khartum and Aswan occur six cataracts, making navigation difficult and dangerous. At Wadi Halfa the Nile enters Egypt, and henceforth its narrow valley *is* Egypt, since on either side is barren waste. Ultimately at Cairo it begins to spread out in the Delta, or Lower Egypt, where half the 19 million of Egypt's population live.

Egypt's Cotton

Only about four per cent. of the total area of Egypt is tilled : the portion, that is, that is fertilized by the waters of the Nile or of the irrigation works that are among the most permanent and valuable memorials of British rule. During the summer months cotton, rice, sugar-cane, millet, and maize are grown ; maize and rice in particular during the months, usually July to September, when the Nile is in flood or the flood-waters are allowed past the dams. In winter, November to June, cereals, clover, beans, lentils, onions, etc., are the principal crops raised by the *fellahin* (peasants).

Products that enter into world commerce are cotton and cotton piece-goods, oil, phosphates, manganese, and some sugar cane. Cotton is of great importance. About 1,750,000 acres (approximately a third of the total cultivated area) are given over to it, and in the list of world-producers of cotton Egypt usually occupies the sixth place. It is a plantation industry, made possible by foreign capital and dependent upon overseas markets. During the Second World War, when food crops had preference, the area under cotton dropped to 750,000 acres ; by 1950 the acreage had once again expanded, this time to 2,000,000 acres.

Excessively high prices provoked a reaction abroad—the Egyptian cotton market was overstocked with supplies which could not be sold except at a loss. The government took over the stocks, but far-reaching effects could not be avoided and general dissatisfaction and unrest contributed to the situation in which the reigning monarch was overthrown in 1952.

Cairo, the Egyptian capital, with a population of over 2,100,500, is by far the biggest city in Africa. Next to it comes Alexandria, largest city on the southern shores of the Mediterranean, and principal port of the Levant, with over 925,000. Port Said, at the northern end of the Suez Canal, has 178,000 people ; Suez at the other end, 108,000.

Through the Suez Canal

The 103-mile-long Suez Canal is an international waterway, owned by an Egyptian company with offices in Paris. The general width is 400-500 feet, and the permitted draught for ships passing through the Canal is 34 feet. Passages may be made by day and by night, and the average time for the transit is 11 hours 10 minutes. British shipping makes up about 30-35 per cent. of the net tonnage passing through.

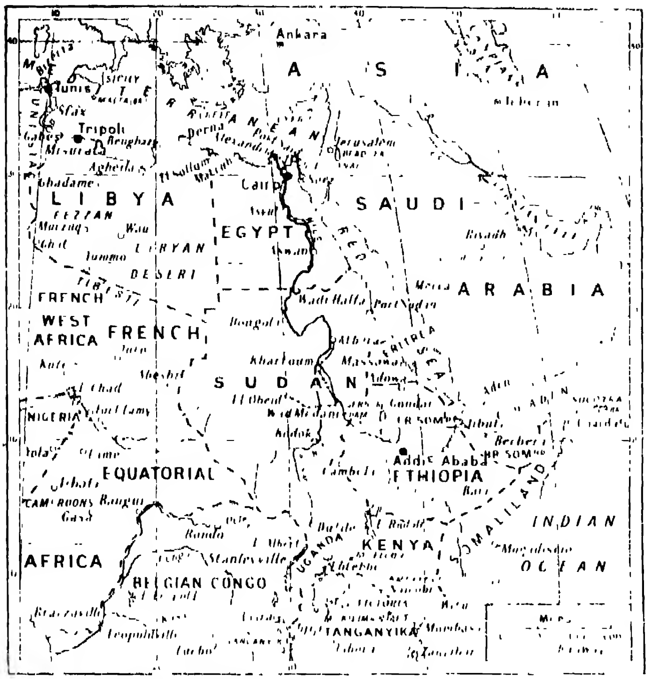
The Sudan

After its reconquest in 1899 from the Mahdists the vast area from the Second Cataract on the Nile to the Uganda border—the Sudan—was administered by a condominium of Britain and Egypt. In 1953 an Anglo-Egyptian agreement guaranteed to the Sudanese the right to determine their own future after three years. At the beginning of 1956 the country was proclaimed an independent republic.

The area is about 1,300 miles from north to south—nearly a million square miles—and the population is 9,000,000, many of whom are nomads. Khartum, the capital, has about 75,000 people. Omdurman has over 125,000. Dura (a species of millet) is the principal crop and staple food of the natives. Between the White and Blue Niles is an area of 500,000 acres under cotton ; it is irrigated by waters stored by the Sennar Dam on the Blue Nile.

Abyssinia or Ethiopia

Abyssinia, called also Ethiopia, is an ancient kingdom which, after being conquered by the Italians in 1936, recovered its independence by force of British arms in 1941. Its estimated area



NORTH-EAST AFRICA, including Egypt and the valley of the Nile

is 350,000 square miles, and its population may number nine or ten millions. Most of the people are engaged in primitive farming or pastoral activities. Exports comprise mainly coffee, hides, and skins. Addis Ababa, the capital (pop. 300,000), is linked with Jibuti in French Somaliland by a French-owned railway, and it is also reached by air from Cairo.

The former Italian colony of Eritrea, nearly as large as England, between the Red Sea and the Sudan, is now linked with Abyssinia in a federation which attaches it to the Ethiopian crown but allows it local autonomy. It consists of a mountainous hogsback flanked on E. and W. by flatter territory. Cattle rearing and agriculture are main occupations. At Massawa, the chief port, pearl fishing is carried on.

Uganda

South of the Sudan and reaching to the northern shores of the Victoria Nyanza is the British protectorate of Uganda, an area 94,000 square miles inhabited by over 5,000,000 people, all but some 20,000 of whom are native Africans.

Uganda is a plateau country, and its high altitude gives it a climate more moderate than would be expected from its position so near to the Equator. Much of its surface is rolling grassland, intermingled with patches of dense equatorial forest. The people are self-supporting, and cotton and coffee are the chief commercial crops. Entebbe on Lake Victoria is the seat of the administration; Kampala, a few miles up country, is the commercial centre.

Tanganyika

South of Uganda, on the other side of Lake Victoria, is the British trustee territory of Tanganyika—German East Africa of earlier days. The territory is nearly four times the size of Uganda, its area being about 360,000 square miles. The population consists of over 7,000,000 natives, with 17,000 Europeans, and some 77,000 Asiatics, mostly Indian traders and shopkeepers and their families. It has a coastline of approximately 500 miles on the Indian Ocean, and on this seaboard stands the capital, Dar-es-Salaam, with 99,000 inhabitants.

The lowlands facing the ocean are hot, moist, and often unhealthy. Inland, on the plateau, conditions are temperate. Here cotton, coffee, copra, and sisal are cultivated, both on plantations and on the native holdings. Tanganyika is the world's chief source of supply of sisal. The forests on the lowland and the mountain slopes are government timber reservations.

Kenya

Between Abyssinia and Tanganyika is the British colony and protectorate of Kenya, the protectorate consisting of the mainland territories of the sultan of Zanzibar. The island of Zanzibar, with Pemba and some other small islands close by, constitute another British protectorate.

Kenya has an area of 225,000 square miles, with a population of about 5,500,000, of whom rather more than 100,000 are Europeans, Asiatics, and Arabs. The vast majority are Bantu tribesfolk. Along the coast is a plain which may be described as a planter's country, and the coconut palm predominates.

Behind is the highland plateau, generally regarded as being suitable for European settlement. Sisal, flax, coffee, and maize are among the chief crops, and stock-farming is on the increase. During the Second World War there was a big development in the cultivation of pyrethrum, a plant with daisy-like flowers which, when dried and crushed, makes a powerful insecticide.

There are four provinces: Coast (capital, Mombasa), Central (Nairobi, capital of the colony, pop. 140,000), Rift Valley (Nakuru), and Nyanza (Kisumu). The Uganda Railway

runs from Mombasa to Nairobi and on to Kampala, and there are subsidiary lines. The Kenya railways are state-owned. The highest railway in the British Commonwealth is a stretch of the Kenya-Uganda railway near Timboroa, 9,150 feet above sea-level.

Between Northern Rhodesia and Mozambique lies Nyasaland (total area 49,000 sq. miles, land area 37,000 sq. miles; pop. 2,423,000 natives, 4,500 Europeans, 5,230 Asians). Coffee, cotton, and tobacco are produced. In the south are tea plantations. Zomba, on the slopes of Mount Zomba, is the seat of administration. Nyasaland, a British protectorate from 1891, is now federated with Northern and Southern Rhodesia (*see* Lesson 37, page 918).

LESSON 35

The Countries of the Congo

Occupying the heart of Equatorial Africa is the basin of the river Congo. The physical features of this enormous region are extraordinarily varied - great mountain ranges, snow-capped volcanoes, vast swampy forests, breezy uplands, and broad lakes and mighty rivers surrounding hot and feverish low-lying marsh and lagoon - an immense area more than two million square miles in extent.

Within its borders are some of the most intelligent native communities and primitive craftsmen in the world. The fauna constitutes a zoologist's paradise.

Course of the Congo

The Congo has its headwaters in the plateau between Lakes Nyasa and Tanganyika, and in its course of over 3,000 miles it receives many tributaries, draining with them an area second only to the Amazon's in point of size.

For most of its course the Congo river flows through the colonial realm of Belgium, the Belgian Congo. Some 600 miles from where it empties itself into the Atlantic it begins to form and continues as the boundary with French Equatorial Africa, the Middle Congo.

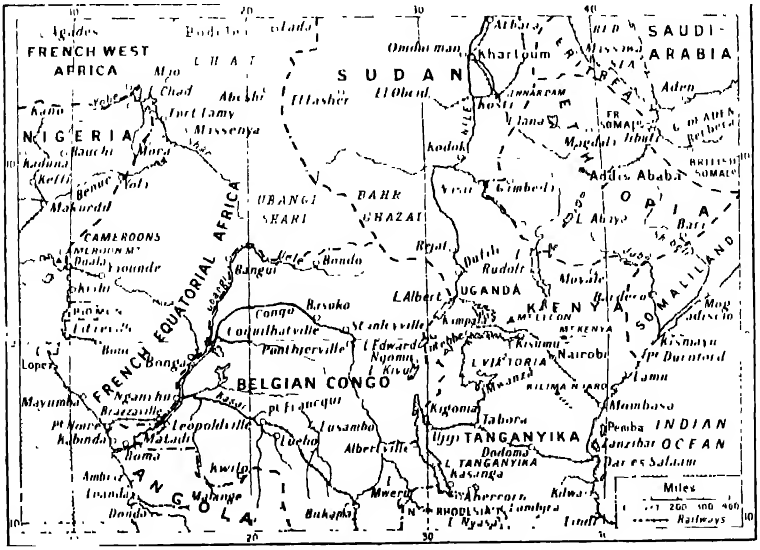
French Equatorial Africa

From the Atlantic to the borders of the Sudan, French Equatorial Africa stretches for nearly 1,500 miles. On the north it reaches to Lake Chad, on the south to the banks of the Congo. It includes Gaboon, Middle Congo, Ubangi Shari, and Chad, with a total area of not far short of a million square miles, inhabited by more than four million natives, with 20,000 or so Europeans.

Gaboon and Middle Congo have coasts on the Atlantic, but they extend across the mountains into the heart of the northern part of the Congo basin. They have a heavy rainfall, and much of their area is covered with dense forest. Wild rubber is important, and the vast timber resources include trees specially suitable for the making of plywood. There is some production of palm-oil, and coffee, cocoa, and cotton are cultivated. Libreville is the capital of Gaboon. The Middle Congo's chief town is Brazzaville, on the north side of the Congo and facing Leopoldville in the Belgian Congo across the rapids.

A railway 318 miles long links Brazzaville with its port, Pointe Noire. Brazzaville (73,000) is the headquarters of the governor of the whole of French Equatorial Africa.

The Chad slopes down from the plateau to the basin of Lake Chad; in the south there are grasslands of savanna type; in the north there is little but desert. Fort Lamy is the chief town and a centre of trans-Saharan routes. Ubangi-



CENTRAL AFRICA: the basin of the Congo.

Shari, lying to the south-east of Chad, has very much the same physical structure and appearance. Its capital is Bangui, on the Ubangi, a main tributary of the Congo.

Belgium's Overseas Empire

Once the private estate of Leopold II, the vast territory of Belgian Congo, in the heart of Africa, constitutes Belgium's overseas empire. It contains most of the basin of the Congo, and its area is estimated at just over 900,000 square miles, with a black population of over 11,750,000. The whites number 75,000 or so—administrators, traders, missionaries and the like. The main division of the colony is into six provinces, and the capital is Leopoldville.

Most of the surface is covered with the thick and dark forest of the equatorial region but, more especially in the south, there are areas of open grassland. Economically the most important regions are the central basin and the Katanga. Agriculture of a primitive type is carried on; cassava, maize, rice, sugar-cane, yams, millet, bananas, are cultivated.

The products of most value are palm-oil, palm-kernels, cotton, ivory, rubber, and copal gum. Plantation rubber has mostly taken the place of wild rubber. The former German territory of Ruanda-Urundi, rich in cattle, later administered by Belgium under a League of Nations mandate, is now a U.N. trusteeship.

The Katanga country, in the extreme south of the colony, bordering on Northern Rhodesia, is a great copper-producing area. The chief mining districts are at Elisabethville and along the railway from Bukama to the Rhodesian frontier. Coal required specially for smelting comes from the Wankie coalfields in Southern Rhodesia.

Cattle thrive on the Katanga plateau; it is one of the few regions in the Congo from which the tsetse fly is absent. The Katanga is connected by railway with the Cape, Benguella (Lobito Bay) on the west coast, and Beira on the east. There is an all-Belgian route by rail to Ilebo (Port Francqui) on the Kasai and thence downstream to Matadi, on the Congo estuary, the river's principal port.

LESSON 36

Southern Africa

Southern Africa is mainly part of the British Commonwealth. A tableland with a narrow coastal fringe, it extends from the southern end of Lake Tanganyika, about lat. 10° S., to Cape Agulhas, lat. 35° S., about 1,800 miles. It lies between the Indian and the South Atlantic Oceans. Its extremity is one of the great sea corners.

It is the chief African area which has been sedulously penetrated by the European, and entry has been in general from the southern tip. After a series of vicissitudes the Union of South Africa became one of the fully independent partners in the British Commonwealth.

The white population, whether of Dutch or British descent, numbers 2,250,000; there are 9,250,000 non-Europeans. In the west are Hottentots and Bushmen, in the east Zulus and other Bantu Negroes. Throughout, the problem of the coloured races tends to be acute. After the Second World War there was a recrudescence of Afrikander nationalism, coupled with the adoption by the Nationalist party of the policy of apartheid—the segregating of the different racial groups.

The Union is composed of four provinces: Cape of Good Hope, Natal, Transvaal, and Orange Free State. Its total area is 472,550 square miles. The largest city is Johannesburg, the mining centre on the Rand, with 364,000 Europeans out of a total population of 912,000.

The seat of government of the Union is Pretoria, the old capital of the Transvaal Boer republic, which has 151,000 Europeans and a total population of 283,000; but Cape Town (pop. 633,000, including 267,000 Europeans) is the seat of the legislature. Durban, chief city of Natal, has 130,000 Europeans and a total population of 420,000. After these comes Port Elizabeth, with 83,000 Europeans, total 215,000. Bloemfontein, capital of the Orange Free State, has 52,000 Europeans, total 128,000. Kimberley, famed for diamonds, has 55,000 whites.

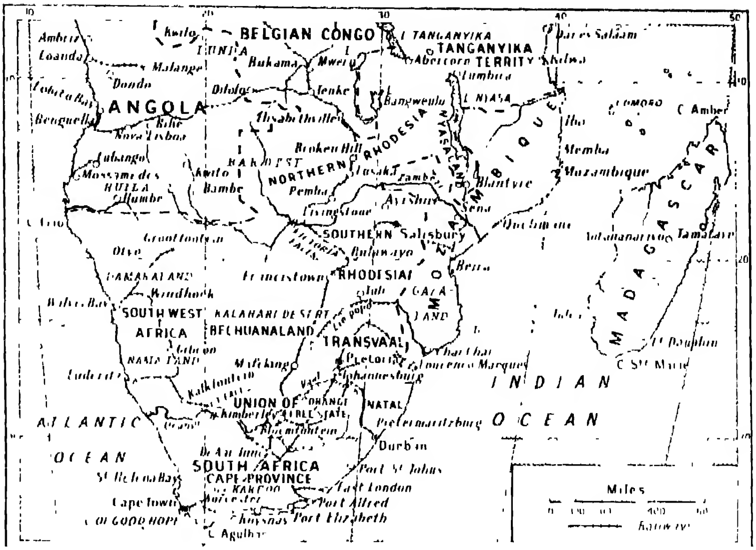
Cape of Good Hope

The largest of the Union's provinces is the Cape of Good Hope. The south-west and the south-east are the most favoured regions, with an equable temperature and considerable rainfall; here the greater part of the population has its home.

Near Table Bay, where the winters are mild and moist and the summers hot and dry, cereals and fruit, including the vine—Cape wines have an international reputation—are grown. In the south-eastern corner maize is grown in preference to wheat, and there are sheep and cattle.

On the Karroo, the high plateau to the north, rainfall is meagre and the heat in summer very great, so that in the main pastoral activities take precedence over agricultural. Tobacco is grown in some parts. North-east of the Karroo is the High Veld, where stock-raising is possible; but the north-west region is so poorly watered

and the vegetation so slight that its economic value is small. In the west, desert conditions prevail. Diamonds occur in the rocks of Griqualand, and at Kimberley are the famous mines of De Beers.



SOUTHERN AFRICA, showing the four provinces of the Union.

Natal is enclosed between the Drakensberg Mountains and the Indian Ocean. The coastal plain is sub-tropical, but temperature falls as one goes inland and up the slope. Sugar, cotton, arrowroot, etc., are grown on the coast, and tea inland. Tobacco and fruits also are produced. In the midland and highland regions farming is the rule, but between Dundee and Newcastle is a considerable coal-mining area.

Lying almost entirely on the High Veld, the Orange Free State has a temperate climate. Wheat and maize are grown in the north-eastern districts, and this area is sometimes called "the granary of South Africa." Goldfields are centred around Odendaalsrust, south-west of Kroonstad.

High Veld and Bush Veld

Between the Limpopo and the Vaal, which, with their tributaries, drain most of the land, the Transvaal consists of the High Veld, or plateau, in the south, and the Bush Veld in the north, with the Banken, or slopes, in between. The High Veld is steppe country, grass with few trees, largely given over to stock-raising, though maize is grown. The Witwatersrand runs across the veld west of Johannesburg: its rocks contain gold, the extraction of which has been the basis of South Africa's prosperity.

East and south of Johannesburg are coalfields of great importance to the Union's economy. Vereeniging has steel works, many engineering and other industrial works, and the largest steam-power station in the Commonwealth. In the Banken cotton is cultivated as well as tobacco; but farming is the chief activity. North-east of Pretoria is the Premier diamond mine. The Bush Veld, low and warm, has good pasture for cattle and other stock.

South-West Africa

Administered by the Union of South Africa since the First World War, the territory of South-West Africa, from the Orange to the Kunene, facing the Atlantic, is for the most part a series of plateaux, sparsely peopled. Agriculture is almost impossible, because there is little water and only slight rainfall. There is some stock-raising. The Ovambos, Hereros, Hottentots, etc., are in various stages of barbarism; the Bushmen are the most primitive, as they are the oldest, inhabitants of South Africa.

Bechuanaland, Basutoland, and Swaziland are native territories under British rule and called High Commission Territories. A great stretch of Bechuanaland is taken up by the Kalahari Desert, which is far from being the legendary sandy waste.

The Rhodesias and Nyasaland

Southern Rhodesia became a British colony in 1923, Northern Rhodesia a British protectorate in 1923, and in 1953 together with Nyasaland they became a federal state, the Federation of Rhodesia and Nyasaland. Southern Rhodesia has an area of 150,333 square miles, with a population of over 2,259,900. Northern Rhodesia's area is 287,640 square miles, population over 2,000,000. Nyasaland has an area of 49,000 square miles, population 2,432,600.

The federation is bordered on the south by the Union of South Africa; on the west by the Bechuanaland protectorate and Portuguese West Africa; on the north-west and north by the Belgian Congo; on the north by Tanganyika; on the east by Portuguese East Africa. The principal crops are tobacco, cotton, tea, and tung nuts. Minerals include gold, copper, asbestos, chrome, zinc, coal, lead, and cobalt.

Most of Portugal's colonial empire is in

Africa. It comprises the Cape Verde Islands, Portuguese Guinea, the islands of Principe and San Tomé, and the territories of Angola (Portuguese West Africa) and Mozambique (Portuguese East Africa).

Angola and Mozambique

Angola has an area of 481,000 square miles, with a coastline a thousand miles long; its people number over 4,000,000, almost all Negroes. The capital is St. Paulo de Loanda. From Lobito Bay, 20 miles north of the former slaving-centre of Benguella, the trans-African railway starts its tortuous and lengthy course across the continent—over Angola to the Belgian Congo, where it traverses the Katanga copper-mines area, across Northern Rhodesia to terminate at Beira in Mozambique.

Mozambique, or Portuguese East Africa, with an area of nearly 300,000 square miles and a population of some 5,750,000 is still mostly undeveloped economically. But Lourenço Marques, the capital (pop. 48,000), Beira (15,000), and Chinde are important as gateways to and from the interior.

The Delagoa Bay railway runs from Lourenço Marques to Pretoria, where it links with the Union system; and the Beira railway, as already noted, joins the Southern Rhodesian line. Then the Trans-Zambezia and the Central Africa railways, linked by the Lower Zambezi bridge, give railway communication from Beira to British Nyasaland.

Madagascar

One of the world's largest islands, Madagascar (French) has an area of over 240,000 square miles and a population of 4,500,000, most of whom are Malagasy. The east of the island is forested, and the plateau in the centre has an indifferent soil, so that cattle-raising is the chief pursuit of the natives. In the lowlands, hot and damp, tropical produce flourishes. Antananarivo, the capital, has 174,000 people; Tamatave, the principal port, some 29,000. Other ports are Majunga, Diego-Suarez, and Tulear.

LESSON 37

Australia, New Zealand, the South Seas

NEARLY 3,000,000 square miles go to the composition of the island continent of Australia, but the Australian people number fewer than 9,000,000. England has over 700 people to the square mile; Australia has only a fraction more than two per square mile—and Australia is 50 times the size of England and Wales. There are fewer Australians than there are Londoners.

To add to the contrast, most of Australia's square miles have no people at all: the areas are desolate bush or desert. Moreover, nearly half the Commonwealth's population is concentrated in the capital cities of the states, in Sydney (1,621,000), Melbourne (1,393,000), Brisbane (459,000), Adelaide (469,000), and Perth (346,000).

New South Wales is the most populous of the states, and nearly half of its people live in Sydney. Hobart, the capital of Tasmania, had 91,000 people in 1951. Canberra, the Commonwealth capital, had only 23,000.

Australia 200 Years Ago

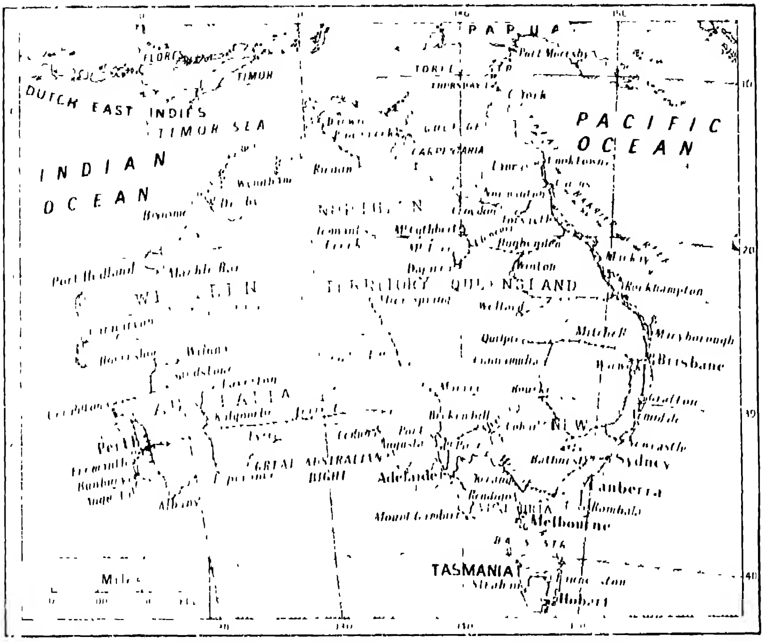
Less than 200 years ago Australia was inhabited only by wandering tribes of aborigines, men in the lowest scale of human life—there are still some 46,000 of them. The Australians of to-day include some of the most vigorous, mentally and physically, of the world's folk; and they have a high standard of living. Australia's birth rate is higher than England's, and her death rate is lower.

Physically the continent is mainly a plateau of old rock, somewhat similar to Africa but with a lower average elevation. The eastern heights are relatively near to the eastern coast and tend to split the rural population into large-scale land-owners inland and small-scale land-workers on the littoral. The middle lowland from the Gulf of Carpentaria to the region of the mouth of the Murray is like the Mississippi valley reversed.

Climate

Climatically the continent is marginal. In general, rainfall tends to be insufficient, either on the whole or where needed most in the south-east during the crop-growing season. The north coast is hot, with summer rains of a monsoon character; the extreme south coast is warm, with winter rains; between them is the arid desert, fringed by scrublands where cultivation and usefulness for pasture are marginal. The eastern littoral has south-east trade winds on-shore, and is in places too wet for development.

A vast unpeopled heart with here and there on the periphery on the coast or near it, a cluster of population or an area given up to agriculture or industry: that is Australia. In between the settlements, stretch for hundreds, even thousands, of miles almost entirely unpopulated wastes. The chief means of communication are the railways; but there is still no common rail gauge.



AUSTRALIA. Sketch map of the island continent.

Each state has its own local system, converging on its capital. Nearly 2,000 miles of the 27,000 miles of line open are owned and operated by the Commonwealth government. Chief among these Federal lines is the Trans-Australian, 1,108 miles in length, which runs from Kalgoorlie in Western Australia to Port Pirie in South Australia, whence there are railway connexions with the east coast.

There is still no railway directly linking the north of the continent with the south; but between Birdum, where the North Australia railway, a Commonwealth line, peters out into nothingness, and Alice Springs, whence another Federal railway, the Central Australia, runs to Adelaide, a new all-weather highway was constructed during the Second World War. From Tennants Creek, about halfway between Birdum and Alice Springs, another new road links up with the Queensland road system.

Gold and Silver

Australian prosperity in the first instance was very much a matter of chance, though it has been fostered and perpetuated by human toil skilfully directed and applied. It was fortunate that gold occurs in Australia's rocks; the first great influx of people, after its discovery in 1851, consisted of gold-seekers.

From 1890 onwards for 20 years the gold mined in Australia was from a fifth to a quarter and then to a sixth of the quantity mined in the world. Since 1910 gold-mining in Australia has steadily become less important. The quantity now is less than 5 per cent. of the world's total, and only half the yield of the U.S.A. or Canada and a tenth of that of South Africa.

The story of silver in Australia is not unlike that of gold: progress until 1910, then decline. The Australian silver yield has dropped from about 10 per cent. of the world's supplies to about 5 per cent. In the production of lead Australia holds second place to the U.S.A.'s first; in zinc she is surpassed only by Canada. Coal, now by far the most valuable mineral product of Australia, is mined in the eastern littoral between Sydney and Brisbane. The town of Newcastle (136,000 pop.), 102 miles by railway N.N.E. of Sydney, is on the largest coalfield in the Australian Commonwealth.

Other minerals of commercial importance include copper in Queensland, Tasmania, South Australia, and New South Wales; tin in all the eastern states and Tasmania; silver, lead, and zinc in New South Wales (Broken Hill district); silver and lead also in Queensland and Tasmania; wolfram in Queensland; and uranium.

Ores of iron are in large quantity in almost all the states; of these the most important is the Iron Knob, a hill of iron ore containing a high percentage of iron, which is situated 40 miles W.S.W. of Port Augusta (South Australia). This is smelted and worked up into various iron and steel products at Newcastle (New South Wales).

Agriculture

Most of the central lowland is grassland, the downs—grassland with summer rains and a tendency to aridity, and increasing temperature from south to north. The normal sequence—sheep for wool, sheep for meat, cattle for hides and beef, wheat on a large scale—has been followed nearer the settlements; the outlying districts are entirely marginal, with sparse sheep or cattle. Wool retains its pre-eminence; in mid-20th century the crop was 1,155 million pounds—about a sixth of the world's supply. Australia produces about 180 million bushels of wool a year.

New Zealand

The North and South Islands, which, together with Stewart Island, comprise the Dominion of New Zealand, are to some degree in contrast. The South (58,000 square miles) is compact in shape; the North (44,000 square miles) has bays and lengthy peninsulas. The South has a backbone of mountain, the Southern Alps, snow-capped and with large glaciers.

The North has a central plateau with volcanic peaks, a large lake, hot springs, and mud or water geysers, and every evidence of volcanic activity, punctuated at intervals by earthquake shocks. The South has comparatively small rivers, and rock-valley moraine-dammed, long, narrow lakes and coastal fjords, with the Canterbury plains to the east. The North has greater rivers and little real lowland, except in the neighbourhood of Auckland.

In these islands live 2,037,000 people; some are Maoris, probably the most intelligent of the semi-indigenous races of the world. A third of the people live in the chief towns—Auckland (pop. 329,000), Wellington (133,000), Christchurch (174,000) and Dunedin (95,000).

Products

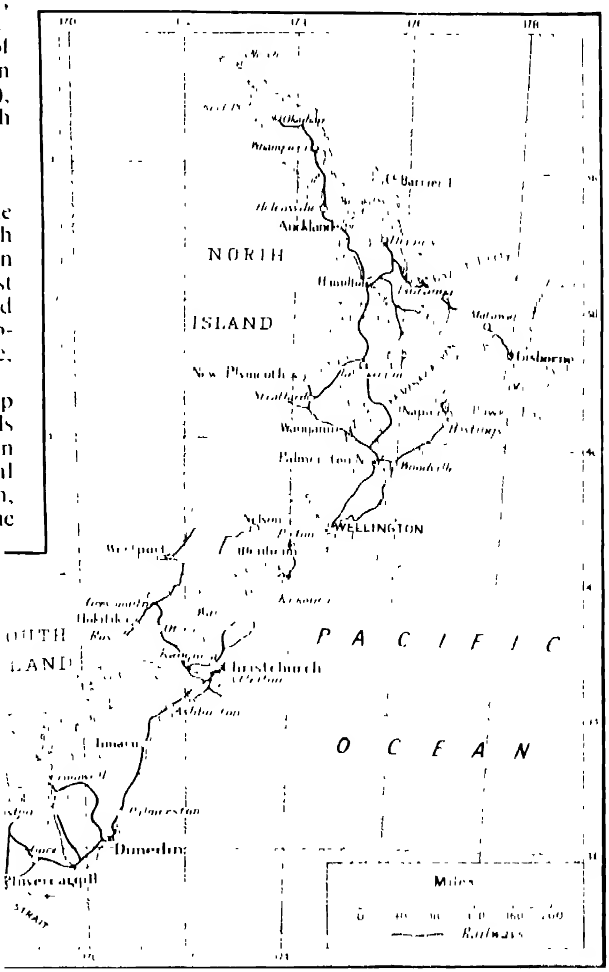
New Zealand exports no cereals. Some gold and some coal are mined, in both cases roughly a quarter as much as in Australia. The country depends almost entirely on its production of wool and mutton, with the addition of dairy products, chiefly high-grade butter and cheese, and fruits.

The relative size of the annual wool clip—a third of that of Australia, two-thirds of that of Argentina or the U.S.A.—is an additional indication of the marginal character of the New Zealand situation, for wool is the first product in the sequence of exploited products of the great farming areas of the world. With a more extensive and more reliable rainfall, and with a more equable and more temperate climate than Australia, the islands are probably more suited to a large population than Australia is.

New Zealand's chief agricultural region is the Canterbury Plains in the South Island, with their surrounding downs. Here most of the wheat and meat of the country is produced. The Otago province contains some of the best agricultural land, but two-thirds of New Zealand is suitable for farming or grazing.

Coal is worked in the vicinity of Westport and Greymouth, and Westland is a flourishing gold-mining district. High relief and plentiful rainfall have made the development of water power in the South Island an easy matter and hydro-electric installations provide over 95 per cent of the total electric power generated by public utilities.

In the North Island the Auckland peninsula has a climate and natural products of Mediterranean type. Auckland is the largest city in New Zealand, but Wellington is the capital. Railway and road communications in all parts of the country are first rate; the 3,535 miles of railway are almost all government-owned.



NEW ZEALAND: the North and South Islands, and Stewart Island.

In the South Sea Islands, New Caledonia (French) produces nickel, but the export has declined heavily in face of competition from Canada. The Fiji Islands (British) produce sugar canes, copra, and fresh fruits. Nauru (British, Australian, and New Zealand Trusteeship Territory) is noted for its phosphates; Samoa (N.Z. and U.S.A.) for copra and cocoa New Guinea (W., Dutch; S.E., Australian Papua; N.E., formerly German—Australian Trusteeship Territory of New Guinea) exports copra; other products are cocoa, coconuts, gold, silver, platinum, and rubber. Hawaii (U.S.A.) exports sugar and pineapples. Many of the South Sea islands are important in connexion with ship and cable routes.

BOOK LIST

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MONEY AND BANKING

MONEY and banking underpin the pattern of life of everyone. This Course provides a solid foundation of knowledge of monetary theory and of banking practice. It describes the various means used in attempts to rebuild the network of commerce and industry after war, and it shows how such organizations as the Stock Exchange, the Bank of England, the International Monetary Fund, the International Bank, and the European Payments Union function.

The student is referred also to the Courses on ECONOMICS *(Vol. 1) and* ACCOUNTANCY *(Vol. 3).*

11 LESSONS

respect, long regulated by the Bank Charter Act of 1844, are now regulated by the Currency and Banknotes Acts of 1928 and 1954.

During 1914–1928 the gold sovereigns and half-sovereigns had been replaced by Treasury notes for £1 and 10s., and these, together with the Bank of England notes of £5 and upwards, had formed the note circulation during those 14 years. The primary purpose of the 1928 Act was to amalgamate the two issues, and this involved a redrafting of the note issue law as laid down in the Bank Charter Act of 1844.

During the First World War (1914–18) and later, Treasury notes for £1 and 10s. were legal tender money; and one of the first changes which the Act of 1928 had to make was to give this legal tender power to the Bank of England notes for £1 and 10s. Previously £1 and 10s. bank notes had not, for various historical reasons, been legal tender in Great Britain.

The Issue Department may issue in the first place notes to the amount of gold held by the department in the vaults of the Bank of England. The gold was valued at the price of £3 17s. 10½d. per standard ounce according to the Gold Standard Act of 1925, until 1939 when an Act authorised the Bank's gold reserve to be valued each week at the current price.

The Fiduciary Issue

Over and above the notes thus issued against a pound-for-pound backing of gold, the Issue Department may issue notes against securities (particulars of which the Treasury may require), to a government-authorised amount. This is called the *fiduciary issue.*

The Currency and Banknotes Act further provided for the revision of the amount of the fiduciary issue, as it was felt there should be some elasticity in the amount of gold needed to maintain the banknote circulation at an adequate figure, should a special alteration in circumstances make any considerable change in the gold reserve desirable.

The Act also provided that, by arrangement with the Treasury, the fiduciary issue might be reduced. This provision was designed to protect the Bank's profits if the note issue, as determined by the Act, became excessive.

Currency and Banknotes Acts

When the Currency and Banknotes Act of 1928 was passed, the fiduciary issue was fixed at £260 millions. But this proved an inconvenient and, indeed, impracticable limit, and various changes had to be made from time to time before 1939. At the outbreak of the Second World War the Treasury was empowered to authorise the Bank, at its request, to issue notes in excess of the current fiduciary issue for a period not exceeding six months.

This authorisation was extended from time to time during the war, as the method of financing operations put more and more money into the hands of the general public, and in 1946 the fiduciary issue had reached the total of £1,400 million. It continued to grow, and the Currency and Banknotes Act, 1954, was passed, providing for a fiduciary issue of £1,575 million, with power for the Treasury to vary the new limit at the request of the Bank. It has varied at different times, and in May 1955 it was £1,775 million.

Of the securities held by the Issue Department against the notes of the fiduciary issue £5,500,000 may be in silver coin, though in wartime it may be very much less. Most of the backing consists of the government's debt to the Bank (£11,015,100, dating back to the early days of the Bank's history), a large amount of other government securities, and a relatively small amount of other securities.

Profits to the Treasury

The profits of the Issue Department belong not to the Bank but to the Treasury. These profits consist of the interest received on the securities held against the fiduciary issue, less the expenses of printing the notes, the value of old notes presented after being written off, etc.

The Issue Department is entitled to write off banknotes of £5 and over if they have been in circulation for 40 years without returning to the Bank, after 20 years for notes of £1 and 10s. If any of the notes that have been written off subsequently turn up they are duly honoured, and their amount must be debited to the Issue Department's account. The balance on this account is paid monthly into the Exchange Equalisation Account.

Another provision of the Act of 1928 gave the Bank of England power to require returns of, and, if it desired, to requisition, any gold held by anyone else in the country. This was designed to make it certain that the Bank of England could, by centralising in itself the gold reserves of the country, maintain its position in the world banking system.

Under the 1928 Act a person who prints, impresses, or stamps any words, letters, or figures on a banknote is liable to be fined £1. And the Act provides that the Bank shall arrange with the Treasury the details which must be shown in the weekly bank return, which still has to be made under the Bank Charter Act of 1844.

LESSON 2

How to Understand the Bank Return

As stated in the preceding Lesson, the Bank of England is required to issue each week a Return showing the position of affairs in its Issue and Banking Departments. The Return is dated the Wednesday and published in the leading newspapers on the following Friday.

Here by way of example is the Return dated May 25, 1955. Under the heading "Issue Department" is the following balance sheet:

	£
Notes issued	
In Circulation	1,752,216,427
In Banking Department	23,144,592
	1,775,361,019
And on the other side	
Government Debt	11,015,100
Other Government Securities	1,760,268,255
Other Securities	704,815
Coin other than gold coin	3,011,830
Amount of Fiduciary Issue	1,775,000,000
Gold Coin and Bullion	361,019
	1,775,361,019

Note that the full amount of the fiduciary issue is issued, and as the gold and bullion held is valued at £361,019 (at 250s 11d per fine oz.), the total amount issued is £1,775,361,019 Of this £1,752,216,427 is in circulation The remainder is in the Banking Department

The profits of the Issue Department belong not to the Bank of England but to the Treasury, and so the Issue Department may be regarded as a government office for the issue of notes: it has none of the functions usually associated with a bank. The Banking Department of the Bank of England is, however, a bank in the usual sense of the term It has the capital subscribed by its stockholders whose shares were transferred to the Treasury in 1946.

The capital and deposits are employed in uses which have some degree of similarity to those to which ordinary commercial banks put their funds: the Bank invests them in government and other securities, discounts bills, makes advances to customers, and holds bank-notes and coin.

Here is the Banking Department's return for the same date, May 25, 1955:

Proprietors' Capital	14,553,000
Rest	3,408,027
Public Deposits:	
Public accounts	13,654,696
H.M. Treasury special account	6,867,574
Other Deposits:	
Bankers'	240,464,133
Other accounts	65,626,561
	344,573,991
And on the other side	
Government Securities	293,216,629
Other Securities	
Discounts and Advances	11,801,005
Securities	13,988,322
Notes	23,144,592
Coin	2,423,443
	344,573,991

The *Proprietors' Capital* was subscribed long ago, not all at once, and blocks of it could be bought and sold on the stock exchange, where it was quoted at so much per £100 stock The dividend became fixed by custom at 12 per cent. When the Bank of England was nationalised in 1946, compensation stock on a 3 per cent. yield basis was given to old stockholders, and the Treasury became the only holder of Bank capital

The *Rest* is the peculiar name which the Bank of England gives to its reserve capital. It consists of undistributed profits Its amount changes by relatively small amounts, but is never allowed to fall below £3,000,000 Any other bank calls this item its reserve

Public Deposits are the deposits of the British Government, and include exchequer, savings banks, commissioners of national debt, and dividend accounts. They vary very much in the course of the year, tending to mount especially when tax payments are heaviest, in the first quarter of the calendar year, and being depleted noticeably in weeks when there have been big payments of interest on government loans

It is generally considered of great importance that the Bank of England should act as the government's bank, and that the comparable institutions abroad should be bankers for their respective governments. This is because the central bank (the Bank of England here) can then more easily prevent the occasional great flow of money from the public to the government being a source of inconvenience to business.

H.M. Treasury special account is the balance of money made available to the U.K. by the U.S.A. under the Mutual Security Acts 1952 and 1953 It can be used only as provided in these Acts, designed to promote European economic co-operation and defence and to increase productivity.

Of *Other Deposits*, the item *Other Accounts* consists of the amount standing to the credit of the account of the Bank of England's ordinary customers. These deposits are comparable with those of private individuals and firms with an ordinary joint-stock bank

Bankers' Deposits are of special significance. The ordinary banks - Barclays, Lloyds, Midland

National Provincial, Westminster, and so on – deposit part of their funds with the Bank of England. These deposits at the Bank of England, which the Banking Department labels Bankers' Deposits, the ordinary banks regard as equivalent to cash in hand. They keep in their own offices only sufficient notes and coin for till money.

But they do not regard the till money which they are requiring at all hours of the day as a sufficient cash reserve against their enormous liabilities. They therefore place some amount on deposit at the Bank of England, knowing that they can draw on it at a moment's notice, and it is these deposits which constitute the Bankers' Deposits in the Return.

Their enormous significance in the English monetary system is derived from the fact that they form, apart from till money, which is fairly stable in amount, the cash reserves of the ordinary commercial banks which deal with the vast majority of business firms and people.

Government Securities

The ordinary joint stock banks have made it a rule to maintain a more or less constant minimum ratio between their "cash" and their liabilities to the public (i.e. deposits); this minimum ratio is about 8 per cent. Thus a variation in the bankers' deposits cannot exist for long without affecting the total resources which the joint stock banks can put at the disposal of the public by direct lending or by permitting overdrafts.

On the assets side, the Banking Department of the Bank of England holds much the same kinds of assets as the commercial banks; but the proportion of the total represented by each kind is very different. The *Government Securities* consist of long-term obligations (Consols, Conversion Loans, etc.) and short-term obligations (Treasury Bills, etc.) of the British Government, in addition to temporary advances made to the government, and called ways and means advances.

Other Securities are divided. The first part, *Discounts and Advances*, are bills discounted for customers (chiefly bill brokers) and advances made to customers for short periods. *Securities* consist of all kinds of securities --bonds, bills, etc., not obligations of the British Government, which the Bank has bought in the market.

Discounts and Advances thus consist of securities which the market takes to the Bank to sell; Securities consist of securities which the Bank has gone out into the market to buy.

Coin is sufficiently described by its label. *Notes* are Bank of England notes issued by the Issue Department, which the Banking Department has obtained in exchange for securities. These notes are the cash with which the Banking Department can meet the demands of its customers, the commercial banks, for money for circulation.

LESSON 3

Bank Deposits as Money

ONE of the most significant figures in the Bank Return, as already noted, is that of the Bankers' Deposits. The owners of those deposits are the commercial banks: the great joint-stock banks Barclays, Lloyds, Midland, National Provincial, Westminster-- and six smaller banks Coutts, District, Glyn Mills, Martins, National, Williams Deacons - which are called, all together, the London clearing banks; the Scottish banks, and the banks in Northern Ireland, but not the other British banks operating mainly overseas in the Commonwealth.

Credit Balances

Credit balances with these great banks are the money or cash at bank which all business firms and many individuals have, and which they can pay away to other business firms or individuals in settlement of debts. These credit balances at the joint-stock banks are called *deposits*, *bank deposits*, or *bank money*.

It should be noticed that they include not merely credit balances on deposit accounts (time deposits, as they are called in most countries), on which a small rate of interest is paid, but also credit balances on current accounts (demand deposits).

These bank deposits are the most important type of money in use in present-day Britain. In all transactions of any size, bank deposits have taken the place of coins and even of banknotes. Stocks of "money" are held not in coins or notes but in "balances at the bank," consisting in the main simply of entries in the bank books. Neither in the banks nor anywhere else does there exist sufficient gold or sufficient notes to redeem any but a small fraction of the balances if the holders were to exercise their legal right of demanding currency for them.

Except for a comparatively trifling amount of silver and copper token coins, even this currency consists exclusively of Bank of England notes. In form these are "promises to pay on demand," but they are in fact irredeemable in gold and have been irredeemable since the First World War broke out (in 1914).

This small currency backing is sufficient in practice because bank deposits have become real money. Cheques and bills are the medium in which debts and taxes are paid, goods bought, and production financed. In transferring part of his balance to someone else the depositor wants in exchange not cash, useful to him for only small transactions, but goods and services The total volume of this money varies from day to day as new credits are issued and old credits cancelled or withdrawn. Bank balances at the end of 1954 amounted to £6,558 million.

Liabilities and Assets

The vast majority of payments for goods and services are made, then, by cheque, i e by the transference of a bank deposit from one person or firm to another. There are, it is estimated, not less than 30 million active banking accounts in England accounts, that is, that are drawn upon or added to from day to day , and approximately 2,000 million cheques are handled by the banks in the course of a year.

The total value of the cheques drawn each year on banks in England is more than £150,000 million For example, during the first two months of 1955 the London Bankers' Clearing House and the various provincial Clearing Houses handled cheques of a value greater than £25,000 million. Upwards of 6,000,000 cheques are drawn daily

In addition some millions of people have deposit accounts which are not usually operated upon by cheques

Most incomes are in the form of salaries or wages paid by employers in return for work done, and virtually all employers have the greater part of their monetary resources in the form of bank deposits, and the amount of work they can undertake and pay for in the immediate future depends upon the amount of bank deposits which they expect to have at their disposal during that future

The total amount paid out in wages and other expenses will be determined by the amount of bank deposits which employers can dispose of ; and any business man will say that this will consist of what he can secure by sales of his products, *plus* any credit he can induce his bank manager to put at his disposal by way of loan or overdraft.

The amount which can be secured by sales depends upon the total amount which the public can secure and the willingness with which the public disposes of its bank deposits by spending on consumption or investment.

There are, then, two elements in the situation : (1) the creation of bank deposits in favour of employers by way of advances, and in favour of the general public, and (2) the way in which the public is willing to use the bank deposits created in its favour.

How do these bank deposits come into being ? The answer is to be found in the balance sheets of the great banks. The following omnibus balance sheet is a summary of the separate balance sheets issued by the 11 clearing banks as at March 16, 1955 :

£ Millions

Liabilities		*Assets*	
Capital and Reserves	178·7	Cash in hand and at the Bank of England	514 0
Current, Deposit and Other Accounts	6 401 6	Cheques, balances and items in transit	275 9
Acceptances, Endorsements, etc	497 6	Money at Call	437 8
Notes in Circulation	0 7	Treasury Bills discounted	849 2
		Other Bills discounted	116·4
		Investments at Book Value	2,280 7
		Advances to Customers	2,024 2
		Liabilities of Customers for Acceptances, Endorsements, etc	497 7
		Investments in Affiliated Banks	34·0
		Bank Premises Account	48 7
	7,078 6		7,078 6

Capital and Reserves are what is owed by the Banks to their shareholders ; they may be considered as being offset by an equivalent amount of the Investments on the assets side, though in part they are represented by the Premises under the last assets item in the balance sheet.

Acceptances and Endorsements (of bills of exchange) are really guarantees that the banks have given for the benefit of their customers, and they are offset by the item Liabilities for Acceptances, etc., on the assets side.

Cheques, balances, etc , are in effect so much cash, shortly to be received.

Money at Call is loans to business firms, bill brokers, etc., in the City of London.

Other Bills discounted are bills of exchange which have been cashed for customers before their due date.

Treasury Bills discounted are really loans to the Treasury for three or six months, made by discounting a " Bill " or promise to pay. They are the Treasury's principal means of short-term borrowing, the banks, etc., being invited to " tender," that is, offer, for a stated number of millions of pounds of Bills ; thus if a bank offered £99·5 per cent. for 3 months' Treasury Bills it would really be offering to lend at about 2 per cent. per annum. On March 31, 1955, there were outstanding £4,931 million of such bills.

Investments, too, consist in large measure of government securities.

Loans and Advances are made to customers.

From the foregoing analysis the nature of Bank Deposits will be clear. They are created or come into existence :

(1) by the deposit by members of the public, who are customers of the banks, of cash which the banks hold as till money or at the Bank of England ;
(2) by advances to customers ;
(3) by the discount of bills of exchange, and
(4) by investments, i.e. the purchase from the public of long-term securities

Deposits and Withdrawals

The first method is quite simple and straightforward. A man takes Bank of England notes, with perhaps some coins, to his bank, and has them credited to his account. His account shows a balance of, say £58 5s 9d. more to his credit than it did before, and the bank's holding of cash (either in till money or at the Bank of England) is increased by the same amount as its liability to the customer. This is what is happening to millions of customers' accounts every day.

At the same time millions of other people are drawing out cash from their bank accounts. That is to say they are reducing their credit balances at the bank by certain amounts, which they take out in cash. To that extent the liabilities of the bank to customers are reduced, and the cash holdings of the bank are reduced, to exactly the same extent.

Thus the two kinds of transactions - the depositing of cash and the withdrawal of cash - are continually tending to cancel each other, so that, though the total withdrawals and the total deposits of cash (and consequently the total decreases and the total increases of bank deposits) are each very large every day, the net changes in the bank's balance sheet - the net changes in deposits and in cash holdings - are relatively small.

Loans and Overdrafts

In the creation of bank deposits by the making of advances to customers the banks use two methods, called the overdraft system and the loan system. In the *loan system* the bank agrees to lend, say, £1,000 to Mr. A for a period not exceeding six months. Then the bank credits A's account at once with £1,000. That amount is thus added to the total of bank deposits - liabilities of the bank to its customers.

On the other side of its balance sheet the bank enters £1,000 as " loan to Mr. A "—that is an asset, or claim against Mr. A. Thus the bank's assets and liabilities have both increased at once by £1,000. Mr. A has £1,000 more at his disposal, which he probably pays away gradually to other people. These other people, paying the cheques into their accounts with the bank, so increase their credit balances.

The position of the bank remains the same, its claim against Mr. A remaining £1,000 though the bank deposits - the bank's liabilities - now stand in favour of B, C, D, and so on, Mr. A having paid away his rights in the £1,000 to them.

In the *overdraft system* the bank agrees to allow Mr. X to overdraw his account to the extent of, say, £1,000. At the moment no change is made on either side of the bank's balance sheet. But then Mr. X begins to exercise his right to overdraw his account. He sends a cheque for, say, £200 to Y, who pays the cheque into his own account.

At this stage the bank has acquired as an asset a claim of £200 against X, X having overdrawn his account to that amount, and at the same time its liabilities - bank deposits - have also grown by the £200 which Y now has standing to his credit. Gradually X pays away the whole £1,000.

Thus eventually the bank's balance sheet looks the same, whether the advance to Mr. X or Mr. A has been by loan or overdraft. Under the latter system the potential buying-power of the public - the total amount which the bank puts at the public's disposal - is not shown in the bank's balance sheet until it has been exercised and the claims which exist against the bank have actually changed hands.

For simplicity we have assumed that the credit which the bank creates is left on deposit with the same bank, either by the person for whom the credit was originally created or by those to whom he pays his claim away. However, there is a distinct probability that at least some of the people to whom the credits are paid away by the original recipients will have accounts at other banks.

The creation of a bank deposit by Bank A may then lead to an addition to the deposits not of itself entirely but to the deposits also of the other banks - B, C, and D, say. Banks B, C, and D then have cheques on Bank A which they can present to Bank A, which pays them by making over part of its cash at the Bank of England. The assets then held by the different banks will then have changed hands to some extent ; but the total increase in bank deposits will be unchanged.

Short-term Advances

Advances made in the City (called *money at call* and *short notice*) have exactly the same effect as advances made to ordinary business customers in the country - the assets and the liabilities of the banks are equally increased by the amounts of the advances. They are different only in the length of time for which the banks promise that the advances need not be repaid.

These advances to the City are sometimes " at call," which means that the banks can demand repayment at any time. Sometimes

they are made for a day, two days, a week, or a fortnight only. They form the first line of defence of the banks ; consequently, they are the first asset realized when actual cash runs down.

Bills discounted are virtually post-dated cheques drawn by one business firm on another business firm. Their term is for one, two, three months or more, few ordinary bills running for more than nine months.

The firm in whose favour the bill is drawn, wanting to have its money at once instead of waiting the three months or whatever the term of the bill is, may take it to its bank manager and ask him to discount it. If the bank manager is satisfied that the bill is likely to be honoured (settled at the fixed date), and that if it is not the customer now bringing it to him will find the sum, the banker will buy the bill from him, at a discount.

This discount represents the interest on the credit which the bank grants until the bill is honoured at maturity, the end of the term of the bill. The bank, then, in discounting a bill creates a credit (a bank deposit) in favour of the person bringing the bill, and, on the other hand, adds to its assets the bill which it expects to be honoured at maturity.

Banks' Investments

When a bank adds to its investments, its broker on the Stock Exchange purchases on its behalf a British or Colonial Government bond or some other high-grade security. The seller of the security in return receives a claim against the bank that is, he receives a cheque, or his account is credited direct with the amount Either way, a bank deposit is created for the amount which the bank has to pay for its investment.

LESSON 4

Importance of the Cash Ratio

OBVIOUSLY, the more bank deposits a bank creates by making advances or by buying securities, etc., the greater its profits, since it will have added to its interest-bearing assets without having to pay anything - or, in the case of deposit accounts, only a very low rate --on the consequent deposit balances of its customers But banks are not primarily money-lending institutions

Their first responsibility is to their customers who have deposited money with them on the distinct understanding that it will be repaid on demand or at the end of a short pre-arranged period. This obligation is a dominant factor in banking practice ; it puts a limit on the use that a bank may make of the money placed with it, and that limit has been arrived at after long experience.

A Rule of Banking

First, a bank maintains a minimum ratio between the amount of the deposits and the cash it retains ready at all times to meet customers' demands. Cash means either currency or a deposit at the Bank of England for which cash can immediately be obtained ; this cash ratio has been for some years fixed by convention among the banks at 8 per cent.

Secondly, the bank uses at least 20 per cent of its deposits to buy Treasury Bills discountable at the Bank of England or to lend at call or short notice in the Money Market. About 30 per cent. of the total deposits is therefore held in cash or in a form which could be very quickly converted into cash.

Of the remaining 70 per cent of deposits about a half is invested principally in government securities readily marketable. For convenience of working, each bank has necessarily to maintain a balance with other banks. This will absorb three to five per cent. of its deposits. Hence a bank's total ability to lend to customers or to grant them overdrafts is limited to about 30 per cent of its deposits at any time

This general method of dealing with deposits is so well established that one can regard it as a rule of banking in Great Britain The individual percentages vary slightly according to circumstances and experience from year to year.

" Ins " and " Outs "

The method of maintaining the cash ratio was lucidly explained by one of the greatest of modern bankers, Reginald McKenna (1863 1943), chairman of the Midland Bank, and a former chancellor of the exchequer (1915-16), in a pamphlet entitled *What is Banking ?*, originally published in *The Banker's Magazine*, and subsequently republished :

> Every cheque drawn on a bank and paid into some other bank will lower the paying bank's cash ratio ; and conversely every cheque paid into a bank will, if drawn upon another bank, raise the ratio of the receiving bank Moreover, in the course of the day currency in greatly varying amounts is both paid in and drawn out, and the cash ratio of the bank will obviously be affected also by every such transaction
>
> Deposits and cash are subject to rapid and unforeseeable change and, though there is a tendency for the 'ins' and 'outs' to offset each other, on occasion the change in a single day may be very considerable How then can a bank work to a steady cash ratio ?
>
> The practice is this. Every morning the chief executive officers of a bank review the cash position They have before them a statement drawn up at the close of the preceding day's business and an estimate

is made of the probable incomings and outgoings during the current day on the basis of experience of customers' requirements and knowledge of their intentions

If the estimate shows that the cash ratio is likely to be impaired, it can be restored either by retaining in cash the proceeds of such of the bank's holding of bills as are maturing during the day or by calling in loans made to the money market. If an excess of cash is shown the surplus may be used to buy more bills, or to make additional money market loans, or it may be invested in accordance with the usual distribution of the bank's assets.

From this it is clear that while any individual bank may in the course of a day's working gain deposits and cash from, or lose deposits and cash to, any other bank, the total deposits of all the banks taken together remain unchanged so long as there is no change in the cash ratio and no change in the total of bank cash. . . "*Variations in the quantity of money depend upon variations in the quantity of bank cash, and over bank cash the banks themselves have no power.*"

To restate the argument—for it is one of vital importance: If bank cash is increased, the use made by the banks of the surplus over the amount required for the 8 per cent. ratio will lead to an increase in the deposits with all the banks taken together. Perhaps they use the surplus to make advances to customers or to buy more government securities.

Then the cash they pay out to the borrowers or sellers will be paid in by the latter to the credit of their banking accounts and new deposits will thus be built up. As the cash comes back to the banks there will still be a surplus over the amount required for the cash ratio, until by repetition of the process new deposits have been built up to an amount roughly 12½ times the initial surplus cash. The normal ratio will then be restored and the added cash will be "surplus" no longer.

Control of Cash

If, on the other hand, bank cash is decreased, reverse operations (called-in loans, sale of securities, etc.) will lead to a tenfold reduction of deposits. The amount of bank cash is the governing factor, and over this the banks themselves have no power. Who, then, has?

The public, in the first instance, since they can vary the amount of currency that they require and retain in their own pockets and tills. But much more important is the Bank of England—the government's bank. Contractors and others who have done work for government departments are paid by cheques drawn on the Bank of England.

These cheques are banked by the recipients at the various joint stock banks where they have their accounts, which banks will now hold increased deposits on behalf of their customers and increased balances at the Bank of England, i.e. bank cash.

While these payments are being made out of the government's account at the Bank of England, its balance is being replenished by receipts of taxation and from public buying of government stock, etc. The amount thus transferred to the government's account is drawn from the accounts of the taxpayers and investors in the deposit banks, so reducing the deposits at the banks and these banks' holdings of cash.

Thus there is a daily circulation of money from the banks to the government account at the Bank of England, and from the government's account at the Bank of England to members of the public.

If all government expenditure were met out of taxation and loans from the public there would be no net change in bank deposits or bank cash. But government expenditure is not met entirely in this way: there is often, especially in war-time, a deficiency, and that deficiency is covered by government borrowing from the Bank of England.

Out of the proceeds of this borrowing, contractors, etc., are paid, and these pay their cheques into their accounts at the joint stock banks; thus the deposits and the cash balances of the latter are increased.

Banks' Surplus

But now there will be no corresponding reduction in deposits and cash such as happens when government expenditure is met out of revenue and direct loans to the government by the public. As a result, the joint stock banks will be left with a surplus over the amount required to maintain the cash ratio.

What will the banks do with this surplus? As likely as not, they will buy Treasury bills and government stock. Thus the whole, or nearly the whole, of the surplus cash will go to feed the government's account at the Bank of England, and will again be paid out as before. Again the deposits held by the banks will rise; again the banks will take up government "paper."

So the process will continue until the banks no longer have a cash surplus; i.e. until the additional deposits have risen to 12½ times the additional cash. Then the banks will be unable to lend anything more to the government—at least, until perhaps private customers have repaid their advances.

Sometimes there is a contrary movement. When taxes are coming in well and the public is taking up loans in a steady stream, the government has no need to borrow from the Bank of England: its receipts tend to be in excess of its payments.

At such a time bank deposits and cash tend to decline, as public payments to the government diminish the amount in the contractors', etc., accounts at the various joint stock banks. The banks' cash ratio tends to fall, and steps have to be taken to remedy the situation. Very likely

Treasury bills due for repayment will not be renewed, and bank cash will be accordingly replenished.

In " normal " times the government does not borrow from the Bank of England save for very short periods: government expenditure is covered by the proceeds of taxation and the sale of stock, etc., to the public. But even so, the operations of the Bank of England are still the decisive factor in determining the quantity of bank cash.

Any purchase by the Bank of England, whether of securities, gold, etc., and any loan made by the Bank increases bank cash ; and any sale of securities by or repayment of loans to the Bank of England diminishes bank cash.

LESSON 5

Modern Technique of Credit Control

As defined by the Bills of Exchange Act of 1882, a bill of exchange is " an unconditional order in writing addressed by one person to another, signed by the person giving it, requiring the person to whom it is addressed to pay on demand, or at a fixed or determinable future time, a sum certain in money, to or to the order of a specified person, or to bearer "

More simply, bills of exchange are documents requiring one party to pay to another party a certain sum on a date fixed by the terms of the bill. The party in whose favour the bill is drawn, wanting the money at once, may *discount* the bill.

The process of discounting is this the party in whose favour the bill stands may make over his rights to a third person, who, in return for the entire right to the amount of the bill when it matures or becomes due, say, three months hence, pays a sum of cash now which represents the sum of the bill less the interest for the three months. This interest (which is deducted from the sum of the bill) is called discount, and is reckoned at so much per cent per annum.

Commercial Bills

Bills have their origin in various kinds of transactions, among the most important being the financing of the importation and exportation of goods. By adjusting the term of the bill to the time during which the goods will be in transit the English importer may defer paying for the goods until they arrive, while, say, the Australian exporter of the goods can get payment as soon as they reach the Australian port of export, because his bank is able to get the bill discounted in London.

The firm discounting the bill, in fact, advances the value of the goods during the time they are in transit, its security being the actual goods on the high seas and its remuneration being the discount, or difference, between the amount it pays at the outset and the sum of the bill which it receives when the bill reaches maturity and is paid—*honoured*, as it is called.

This is just the kind of investment a banker likes, as the term is short – usually a matter of a few months, sometimes only days or weeks—and at the end of that term he knows the exact amount by which he can reduce his investments. At the same time the security is good, as there are the actual goods in transit which will be sold on arrival

Treasury Bills

Treasury bills are, in effect, bills of exchange representing a loan of cash to the Treasury for a period usually of three months. The money is advanced by the people in the market who are willing to do it at the lowest discount. Tenders or offers having been invited by the Treasury each week for the number of bills on offer, those applicants who tender at the lowest price are allotted the bills.

Those receiving them receive thereby a claim to so much cash payable by the Treasury three months later. In return for this claim they now pay a sum which is the amount of the bill (which they are due to receive at maturity) less the discount The price offered, as in the case of all bills of exchange, is expressed in terms of so much discount, e.g. in 1954 the average rate of discount was 12s., i.e £2 8s. % per annum. The amount of Treasury bills issued by public tender was then enormously greater than it was before the Second World War.

The weekly amount tendered for during 1953 varied between £210 million and £300 million. During 1954 the weekly tender was sometimes more than £400 million. The total outstanding on March 31, 1955, was £4,931 million.

The Discount Market

The *London Bill Market*, or the *Discount Market*, consists of the banks (which, as previously explained, consider the discounting of bills a highly suitable way of investing) and of the bill brokers or " discount houses." The bill brokers use partly their own capital and partly funds which they borrow from the banks. These last funds, borrowed from the banks and used by the bill brokers to discount bills, appear in the balance sheets of the banks as money at call and short notice.

The interest paid on them is relatively low, as the bill brokers have to make part of their

profits out of the margin between this interest and the discount margins which they receive by the discounting of bills. That is to say, on the average the market rate of discount for high-class bills has to exceed the rate of interest charged by the banks on their loans to the bill brokers.

Control Operations

During the Second World War the normal methods of importing and exporting were suspended, government departments arranging bulk buying contracts overseas. After the war, gradually the London Commodity Markets were re-established and merchants were again free to import and export most types of goods. By 1955 Britain had regained about 20 per cent. of the world's foreign trade.

As almost every shipment to or from this country involves some form of bill of exchange, the discounting of commercial bills became once more an important part of the activity of the Discount Market. It remains an important part of the organization for the issuing, redemption and replacement of Government loans.

It will continue to act as a clearing house for the liquid reserves of the banking system and to provide an admirable instrument for the control operations of the authorities via the Bank of England.

Rate of Discount

The discount rate varies according to the class of bill. Bills which bear the names of firms highly respected by the market are discounted at a rate very little above that at which Treasury bills (obligations of the British government) are discounted.

Bills drawn by less known firms may be discounted only at a considerably higher rate, though when they have been discounted by a reputable firm that firm can re-discount them at a lower rate, as the reputable firm is liable to pay the amount of the bill in the event of the original parties being unable to do so.

The rate of discount also varies according to the term of the bill. Normally, it is somewhat higher the longer the term of the bill. This is because the longer the term of the bill the more time there is in which something unforeseen may happen, altering the power of the market to continue to hold the bill.

The Bank Rate

Weapons at the disposal of the Bank of England for carrying out its functions and pursuing monetary policy are Bank Rate, open-market operations, and the Exchange Equalisation Account. The Bank Rate is the oldest instrument. It is still fixed each Thursday by the Court of Direction of the Bank of England. For more than a decade, except for a brief spell at the outbreak of the Second World War in 1939, it remained at 2 per cent.; in November 1951 it was increased to 2½ per cent. Before June 1955 it had been altered to 4, 3½, 3, 3½, 4½ per cent., and had once more been used as an effective tool of credit control. In February 1956 it rose to 5½ per cent. It is the rate at which the Bank of England re-discounts bills for other than its customers, and the knowledge of bill brokers that they could re-discount bills in this manner is the chief factor in deciding the market rate of discount.

Money at Call

How can the Bank of England increase or decrease bankers' balances and thus extend or diminish the basis of credit? It can buy or sell part of its holdings of securities. The Bank operates through a broker and either buys "bills" (usually Treasury bills) or some other form of government security when it wishes to increase the funds at the disposal of the market, and sells bills or securities when it wishes to diminish the market's supply of funds.

What happens when the Bank thus buys or sells securities? If the Bank sells securities those who buy them pay by drawing cheques on their own banks in favour of the Bank of England. The banks in general, thereupon, find that their total deposits and their cash at the Bank of England have decreased by equal amounts and they then decrease their earning assets to restore the customary cash ratio.

Their first line of defence is the item "Money at Call and Short Notice," which represents the money they have "out on the Money Market." This is the most liquid of their assets, and if they do find themselves short of cash they withdraw funds from the Discount Market. They can also sell securities or reduce their Advances.

In this way the Bank of England can really control the total volume of credit, provided the clearing banks maintain the fixed cash ratio explained in Lesson 4. The Bank of England from time to time conducts such "open market" operations to dampen extreme fluctuations in the short-loan market, or to support the Bank Rate, or to stimulate or discourage bank loans to customers, or otherwise to expand or to contract the credit base.

It is a principal duty of the Central Bank to control credit, not only in the Money Market but also generally in commerce and industry. Changing the Bank Rate, in association with "open market" operations when necessary, enables the Central Bank to achieve its purpose, so long as the clearing banks maintain the accepted liquidity ratios.

LESSON 6

Stocks and Shares

When the British government wants to borrow for a period of years it does not borrow from a bank, neither does it invite the money market to discount Treasury bills, etc. It makes an issue of bonds or stock that may be purchased by anyone who wants to invest his money in a secure way for the period of years for which the government wishes to borrow.

British government loans are always issued through the Bank of England (the government's banker) and the Post Office. A prospectus is published in the financial papers and the chief national papers, setting forth the full conditions of the loan—the purposes for which the government is requiring the funds, the price of issue, the rate of interest payable, the arrangements for the payment of the interest, the arrangements for repaying (or redeeming) the loan, etc.

People wishing to take up part of the loan are directed to fill in the form of application on the prospectus, and to send it, with a small instalment of the amount they wish to subscribe, to the Bank of England. Applications made through the Post Office are usually for small amounts and payable in full.

Allotment of Shares

The prospectus usually states a date and hour at or before which the subscription lists will be closed. When that time arrives, or, if the authorities are satisfied that sufficient subscriptions have already been sent, before that fixed time, the lists are closed. The Bank of England then ascertains the amount subscribed, and "allots" to each subscriber either the full amount for which he has asked or a proportion only of that amount.

If the issue has been "over-subscribed" (i.e. if the amount subscribed has exceeded the amount of the issue), some subscribers—perhaps all—will be allotted a proportion only of the amount for which they have applied. For certain reasons the large applications are usually cut down more than the small applications.

Some subscribers may find that they have been allotted nothing, in which case the deposit they made on application is returned when the "allotment letters" are dispatched.

Subscribers whose allotment letters say that the amount for which they applied has been allotted in whole or in part are then required to pay a further instalment, the balance being payable in one or more instalments later.

Some issues are of stock, others of bonds. The difference is mainly one of form. Bonds are of certain amounts—£10, £50, £100, £500, and £1,000 perhaps. A subscriber may take up so many bonds of such-and-such amounts. When bonds are bought and sold later they are always dealt in as bonds—a person is obliged to buy so many bonds; it is impossible to buy half a bond.

Stock, on the other hand, though it may usually be subscribed for in multiples of £10 or even £50 only, may be dealt in any amount, however odd. A block of 3½ per cent. Conversion Loan amounting to, say, £115 3s. 4d. may be sold and bought.

Price of Issue

The bond or stock is not necessarily issued at a price equal to the face value, i.e. *at par*, nor is it necessarily redeemed at its face value. The famous 5 per cent. War Loan (a stock) was issued at 95—which means that for every £100 the investor had to pay only £95 cash; that was issued *at a discount* (the price being below par or face value). The original Victory Bonds were issued at 85—so every purchaser of £100 bond paid only £85 for it, while the purchaser of a £10 bond paid £8 10s. for it.

Stocks and bonds may also be issued *at a premium*—i.e. at a price, say 102, above par, though that is less common with government issues. The stock or bond may be redeemed, at the end of its term, either at par or sometimes at a price above par.

If the prospectus states that the stock will be redeemed at 103 on, say, January 1, 1967, then everyone holding this stock on that date would be entitled to receive cash at the rate of £103 for every £100 of stock he held. The par value of the stock or bond is no more and no less than the amount on which the interest is calculated at the stated rate per cent.

Issue Houses

Foreign, dominion, and colonial governments borrow for periods of years by the same process. In their case the issue is sometimes made not by the Bank of England but by an *issue house*. These issue houses are well-known City firms, merchant bankers of long-established and of international repute, e.g. Rothschild's, Baring's, Hambro's, Lazard's, and Morgan's.

The issue house issues the prospectus, and applications have to be made to the issue house (or authorised agents) and the money paid to its bankers. The prospectus of a foreign or colonial government loan usually gives some statistical information about the country concerned, the state of its foreign trade, the national

finances, and other relevant matters. Otherwise the process is the same as that for the issue of a British government loan.

Local government authorities often raise loans in the same way, if the amount required is sufficiently large to justify the expense. All kinds of shipping companies, banks, insurance companies, and manufacturing enterprises, both home and foreign, wishing to raise capital or loans in large amounts, have recourse to the new issue market in London. They issue new capital in shares of various kinds, and loan capital is issued in debentures (bonds or stock) or notes (which are short-term bonds).

When the British railway, electricity, gas, and transport undertakings were nationalised, the owners were allotted special stock in exchange for their shareholdings, interest being guaranteed by the government.

Debentures and notes, being loan capital only, bear interest at a fixed rate. This interest must be paid, and the debentures redeemed at the end of their term, before any dividend is distributed to shareholders. Debenture-holders are not members but *creditors* of the company; shareholders are the *owners*.

If debenture interest is not paid, the debenture holders may put in a receiver to seize or sell the assets so as to satisfy the debt owing to them; shareholders cannot do this because they cannot seize what they already possess.

Shares (of 1s., 10s., £1, £5, etc.) and proprietary stock (which, like government stocks, may be split into whatever blocks the market finds convenient) are both proprietors' capital. They represent a claim to a certain proportion of the company's assets on liquidation, and to a certain proportion of any profits it may distribute in the meantime.

Classes of Shares

Preference shares have a claim on the profits before the ordinary or deferred shares receive any consideration. In return for this preference, holders of preference shares may participate in profits to a certain amount only, the amount being fixed as a percentage of the nominal value of the share. For example, a £100 7 per cent. preference share receives a *dividend* (not interest, be it noted) of £7 (less income tax at standard rate) before the ordinary shareholders receive anything.

If the preference shares are *cumulative*, then the ordinary shareholders are not entitled to any return until all the arrears of preference dividend have been met. Otherwise, the ordinary (or deferred) shareholders receive the residuum. All these stocks and shares may be issued at a premium or a discount, if specially authorised.

When shares or stocks are issued, the borrowers naturally wish to obtain the best terms possible. The price of the shares or stock is, therefore, set as high as is considered compatible with the public demand for such a security. A 5 per cent. stock may in some circumstances be saleable at a price of 98 (£98 to be paid for every £100 stock). But the issuers of the stock may have overestimated the public's demand for the stock.

Underwriting

The public may subscribe for only half of the amount offered. The borrowers want to be certain of the whole amount of the stock being sold: they therefore arrange for the stock to be *underwritten*. The underwriters are financial houses who undertake, for a commission which must be paid whatever the event, to subscribe for any of the stock which is not taken by the public.

When the issuers have estimated the public's demand for the stock correctly, or have underestimated it, the underwriters are not called upon to take any of the stock, and the stock is likely to find a good market at once. If, on the other hand, the issuers have overestimated the public's demand for the stock the underwriters are left with an amount which may be very large.

It is not their business to invest indefinitely in the stocks which they underwrite - they wish to sell what they have taken up quite soon, in order to have funds ready to hold in reserve when underwriting other new issues. The market for the stock is therefore depressed: the stock falls to a discount under the pressure of the underwriters' sales.

A subscriber for stock (or shares) newly issued does not hold the stock for ever. Sooner or later people change their investments, or they have to live on their capital, or they die, and then the stocks and shares they hold are likely to be sold.

The London Stock Exchange in Throgmorton Street, in the City of London, is the place where the members of a private corporation, called the Stock Exchange, meet in order to deal in stocks and shares which have already been issued. There are other stock exchanges at Manchester, Edinburgh, Birmingham, Sheffield, Liverpool, Bristol, Newcastle, Oldham, Glasgow, and Dublin.

Brokers and Jobbers

The members of the Stock Exchange are all called stockbrokers, but they are subdivided into stockbrokers proper and stock-jobbers. The brokers buy and sell on behalf of their clients, the outside public, according to the orders they receive from their clients from day to day and from hour to hour. Their income is derived from the commission, called *brokerage*, which they charge their clients

The brokerage is somewhat higher for large transactions than for small transactions; but it does not increase in proportion, for a large transaction usually involves hardly any more work than a small transaction involves. The brokerage is therefore a trivial consideration to a large buyer or seller of stock, though it is sufficiently important to prevent small transactions being as popular as they might be. The brokerage also varies according to the nature of the *securities*, a convenient name for stocks and shares alike.

As there is a wide market in British government and other high-class securities, the stockbroker can easily carry through transactions in such securities, and the brokerage is therefore low. Industrial securities do not, however, usually enjoy such a wide market, and the brokerage thereon is rather high.

The stockbroker, having received an order from a client, say, to buy war loan, does not buy directly from another stockbroker who has a client wishing to sell war loan. He goes to a stock-jobber on the gilt-edged market and asks him at what price he is dealing in such and such war loan. The jobber then quotes two prices, say 99¼, 99⅜. The higher of these two prices is the price at which he is willing to sell; the lower is the price at which he is willing to buy.

The gap between—⅛ in this instance—is called the *jobber's turn*, and it is out of his turns that the jobber has to make his income. The jobber having quoted his two prices, the broker (who up to now has not disclosed whether he wants to buy stock or has stock to sell) gives his order for the amount wanted by his client, and the jobber provides him with the stock required. The broker then sends a contract note and eventually a stock certificate to his client, who pays £99 7s. 6d., plus the brokerage, for every £100 stock.

Markets on the Exchange

The floor of the Stock Exchange is divided, by custom, into various markets, in one of which every jobber specialises. The chief markets are those in which the jobbers specialise in gilt-edged, foreign bonds, home rails, foreign and colonial rails, home industrials, bank and insurance shares, rubber and South African mining shares (the Kaffir Circus), respectively. The names sufficiently indicate the classes of securities dealt in by jobbers on those markets.

The jobber's turn varies according to the market in which he deals and, within each market, according to the amount of the particular securities in existence. For this variation there are two reasons: first, some securities having more variable prices than others, the jobber is obliged to make his turn greater in order to reduce the risk of losing if the value of the stock falls before he is able to sell it; and second, some securities being much scarcer than others and much less frequently ordered by brokers' clients, the jobber is obliged to make his turn greater to compensate himself should he be unable to find a buyer before he has held the stock for long.

The jobber's turn is therefore higher for industrial securities and other speculative securities, such as "Kaffirs," than for British government securities. It is also higher for the shares of a small industrial concern than for the shares of a great firm such as Imperial Chemical Industries.

The jobber may find that at the prices he quotes, purchases are much in excess of sales. Then he must raise his prices, in order to deter buyers and encourage sellers. The City jargon for a slight rise is "hardening." When "prices harden" it is a sign that jobbers are finding buyers more eager.

When the market is predominantly selling, the jobber does not want to accumulate those particular securities indefinitely. He therefore reduces his prices—prices "droop," or "fall away"—in order to discourage sellers and encourage buyers.

Bulls and Stags

Sometimes people buy securities not for investment but to sell again at a higher price. Such buyers are called *bulls*. Before the Second World War they did not have to pay the full amount of the purchase price; they paid only a portion, called the *margin*. Every Settlement Day (once a fortnight) they had to pay the full amount or a fee in lieu, the *contango*, to someone who lent the amount outstanding. This process was called *buying on margins*. It enabled people to speculate for a rise in price without using an enormous amount of capital.

The contrary position, that of a *bear*, is that of a person who, expecting the price to fall, sells for future delivery. He expects to be able to obtain the security in order to fulfil his contract, at a lower price. On Settlement Day he used to have to deliver the security or pay a fee—*backwardation*. Eventually he had to buy. If his expectations were justified, he made a profit, but if the price had risen, he lost.

A *stag* is someone who subscribes to a new issue with the intention not of holding the stock but of selling it at a profit, if possible when it is still only partly paid for. Another species of stock exchange speculation, formerly quite common, is by way of *put* and *call*. For a consideration a speculator may buy the right to "call" for a particular stock at a particular price, or to "put" or deliver the stock at a particular price. In a word, he is backing his judgement against that of the market.

A new method of making issues of shares has been developed during the last few years that known as the "introduction." A company whose shares are not quoted on the Stock Exchange arranges through a stockbroker for a jobber to "make a market" for the shares, that is, buy some and offer them for sale.

Public Issues

This method is often used when a private company is converted into a public company The shares are advertised in the Press in much the same way as they would have been if a direct issue had been made, and stringent Stock Exchange regulations have to be observed before the Council of the Stock Exchange will allow an "introduction" to be made

When the jobbers have undertaken to market the shares, those interested in buying some of them can instruct their stockbroker to buy them in the usual way. This method of introducing shares to the public is cheaper than an ordinary issue would be. To make a public issue of capital may cost upwards of £30,000. For this reason public issues are generally for large amounts.

Investment Control

During the Second World War and for some time afterwards, all dealings on the London Stock Exchange were for cash ; but towards the end of 1946 the system of fortnightly settlements was re-introduced. There still operates, however, a rigid control of new share issues through an official body known as the Capital Issues Committee, which has to approve all issues of £50,000 or more a year.

This Committee is instructed by the Treasury from time to time concerning the rules it is to apply when considering an application for a proposed issue. By this means, it is considered, a desirable measure of control can be exercised over the methods of utilising the country's capital resources. Thus special emphasis has been given to investments that seem likely to encourage exports.

LESSON 7

ABC of the Foreign Exchanges

By "foreign exchanges" is meant the process of exchanging the money of one country for the money of another. The pound sterling is exchanged, by foreign-exchange dealers, for U.S.A. dollars, Canadian dollars, Indian rupees, Swiss francs, Argentine pesos, Spanish pesetas, the Portuguese escudo, Swedish kronor, and numerous other national monetary units at prices which may vary from day to day. These prices are called the *foreign exchange rates*.

Sometimes the price of a pound sterling is quoted in terms of the foreign money : the pound sterling, for example, is quoted at so many U.S.A. dollars or Swiss francs. Some other foreign exchange rates are quoted the other way round the price of the foreign monetary unit in terms of British money is quoted, e.g. the Indian rupee, quoted at so many pence per rupee. The Australian exchange is quoted in another way—at so many Australian pounds per hundred pounds sterling. There are other variants of less importance.

Whatever the method of quoting, English travellers abroad have to accustom themselves to thinking of the price of the foreign monetary unit in terms of British money. For example, the French exchange stood for long at about 124 francs to the £. English travellers in France, naturally wishing to reckon the English equivalent of very small sums in French money, were then accustomed to thinking of the franc as being worth approximately 2d.—which is only reversing the foreign exchange dealer's quotation. At about 980 francs to the £ (1956), they had to think of it as equivalent to a farthing

Necessity for Foreign Exchange

The necessity for these foreign exchange rates, and for the foreign-exchange dealers who quote them, lies in the fact that goods are sent from one country to another and the importer often has to pay in the money of the exporter's country. He has to buy that foreign money from a bank, which has to settle its transactions ultimately through a foreign-exchange dealer.

Even if the importer contracts to pay for the goods in the money of his own country, that means that the exporter receives the payment in a money which to him is foreign. Then that exporter will want to sell the foreign money in exchange for the money of his own country.

Also people making loans to foreign companies or foreign governments have money of their own country to lend, whereas the foreigners want it changed into money of their own country. When the time comes for the foreigner to pay interest on the loan, he has to secure another money in exchange for his own.

There are also numerous services—insurance, shipping, etc.—which are rendered by the people of one country to the people of another country, and the money of the one country has to be sold in exchange for the money of the other country before payment can be effected in the money which the creditor wishes to receive.

By way of example, the following is a list of the most important foreign exchange rates on June 8, 1955 :

New York (dollars to £1) .	\$2·79$\frac{11}{16}$–79$\frac{13}{16}$
Montreal (Can. dollars to £1) .	\$2·74$\frac{5}{16}$–75$\frac{1}{16}$
Paris (French francs to £1)	978–979$\frac{1}{4}$ f.
Brussels (Belg. francs to £1)	139·80–140·05 f.
Amsterdam (Dutch florins to £1)	10·61$\frac{3}{4}$–62$\frac{1}{4}$ fl
Neth. W.I. (N.W.I. florins to £1)	5·27–5·30 fl
Switzerland (Swiss francs to £1)	12·22$\frac{5}{8}$–24$\frac{1}{8}$ f
Lisbon (escudos to £1) . .	80·65–95 e
W. Germany (marks to £1) .	11·72–73$\frac{1}{8}$ m
Stockholm (kroner to £1) ..	14·46$\frac{1}{4}$–47$\frac{1}{4}$ k
Copenhagen (kroner to £1) ..	19·40$\frac{1}{2}$–41$\frac{1}{2}$ k
Oslo (kroner to £1)	20·01–02 k.
India (sterling to rupee) .	1s. 5$\frac{15}{16}$d.–1s. 6$\frac{1}{16}$d.
Pakistan (sterling to rupee)	2s. 1$\frac{13}{16}$d.–2s. 1$\frac{15}{16}$d

How are these prices—these foreign exchange rates—determined ? The answer is, briefly, that the value of one money in terms of another (the exchange rate between the two moneys) must be such that the demand for each money is equal to the supply of it.

Sale of Pounds

The problem lies, therefore, in the considerations which determine the supply of, and the demand for, any given money in the foreign exchange market.

Consider the value of the English pound in relation to all the other moneys of the world. Foreigners want to sell English pounds in exchange for their own moneys, because they have sold goods to England and been paid in pounds, because they hold British government securities and have been paid the interest in pounds, and so forth.

Other people, both British and foreign, wish to buy English pounds for similar reasons. They may have bought goods in England, insured their goods with London insurance brokers, hired British ships to convey goods across distant oceans.

It will be realized at once that every import of goods into Britain leads to a sale of pounds to purchase the foreign moneys to pay for the goods. Contrariwise, every export of goods from England leads to a buying of pounds by foreigners who have their own moneys to sell. Services rendered by British nationals to foreigners likewise lead to a demand for pounds, whether those services be shipping, insurance, or the service of the English hotel to the American visitor.

Balance of Payments

All these transactions—some creating a demand for pounds and others creating a supply of pounds in the foreign exchange markets—are said to constitute the Balance of Payments (sometimes Balance of International Payments) of the country. They are frequently divided into income transactions and capital transactions.

On income account this country receives payment for exports of goods, government loans and services, shipping services to the trade of the world, interest on previous investments abroad, services of bankers, insurance brokers, etc., to foreigners, and the considerable sums for goods supplied and services rendered in the U.K. to foreign travellers.

This amount is spent largely on goods imported into the country, expenditure of English travellers abroad, the maintenance of British consuls abroad, and so forth. Up to within a few years of the Second World War there was normally a surplus of receipts over expenditure on these income transactions, and this surplus was available for new investment abroad.

Below is briefly set out the Balance of Payments for the United Kingdom during 1952, 1953, and 1954 to the nearest million pounds :

Million £

	1952	1953	1954
Imports f.o.b.	2,946	2,889	3,007
Government Expenditure	172	155	169
Travel (net)	3	1	6
Migrants' Funds . .	15	4	9
	3,136	3,049	3,191
Exports	2,826	2,671	2,815
Investment Income (net)	87	51	35
Shipping (net)	105	124	132
Commissions, etc. (net)	256	318	319
U.S. Defence Aid	121	102	50
	3,395	3,266	3,351
Balance	259	217	+160

The cost of the insurance, banking, and transport of the imports has been deducted from the items Shipping, Commissions, etc. The item Travel indicates that on balance residents of U.K. spent more on travel abroad than overseas visitors spent here. Migrants' funds are amounts that migrants take with them. The item U.S. Defence Aid includes all amounts receivable from the U.S.A. in connexion with mutual defence.

" Invisible " Balance

The " visible " trade balance is the difference between the value of the imports and exports in each year. All the other items except Defence Aid are summaries from the " invisible " balance of payments. Thus, in 1954 U.K. residents spent £m 101 on foreign travel, while overseas visitors spent in the U.K. £m 95 ; this country paid for shipping £m 258, but earned £m 388 ; interest, profits, and dividends payable by this country abroad (principally to America) amounted to £m 258, but investments abroad of this country brought in £m 293. The considerable item of commissions, etc., consists principally of insurance premiums, banking charges, buying and forwarding charges.

To the extent that the surplus (or deficit) available on income account does balance the amount of lending to (or borrowing from) foreigners, there is no necessity for any further movements. But to the extent that the difference on income account does not equal the net balance of the capital account, there will be a difference between the supply of foreign moneys and the demand for foreign moneys to be exchanged for pounds.

If sales of goods and services, interest on previous loans to foreigners, etc., exceed the British purchases of foreign goods and of foreign securities, there are more pounds wanted by foreigners in exchange for their own money than there are pounds for sale by people needing foreign money to pay for foreign goods and securities. There is an excessive demand for pounds, and the price of pounds in terms of foreign moneys therefore rises. This is the meaning of the phrase: "The foreign exchanges are moving in favour of sterling."

If, on the other hand, sales of goods, services, and securities to British people have exceeded, at the existing exchange rate, the total value of foreign purchases of British goods, services, and securities, the supply of pounds is greater than the demand for pounds. Then the price of the pound in terms of foreign moneys tends to fall — i.e. "the foreign exchanges are moving against sterling."

If either of these two occurs — that is, if there is a divergence between the demand for and the supply of sterling in the foreign exchange market — the price must change until demand and supply are equal with each other.

Suppose, first, that there is an excessive supply of sterling, so that its price falls. Then some financiers, who know the foreign exchange market well, may think it worth while to increase their holdings of sterling for the time being, since they anticipate that later the price will, for one reason or another, rise again.

Consequently, at a price, they are willing to buy the excess of pounds, giving in exchange some foreign money. Also, people who were about to buy foreign money — say, for the purpose of buying goods in New York — may be induced to wait a little before making their purchases of dollars. In this way the pressure on the pound sterling is relieved — some of the sellers abstain from proceeding with their transactions.

But relief in these two ways — an increase of demand and a decrease in supply — is brought about only at a price. The price of the pound must fall sufficiently low to make people buy more pounds and sell less to the extent necessary to eliminate the divergence between demand and supply.

If there is an excess demand for pounds at the outset, then a rise in the price of the pound stimulates financiers to sell pounds in exchange for foreign currencies, hoping to buy back pounds at a later date when the pound has fallen back. Likewise, people who were about to buy pounds may be induced to abstain for the time being, in the expectation of being able to satisfy their requirements later at a less expensive rate.

The price of the pound must go on rising until the supply of pounds has been stimulated and the demand for pounds reduced to an extent sufficient to equalise demand and supply once more.

Even if these speculative demands for, and supplies of, a money — say, English pounds — can be evoked by a comparatively slight movement of the exchange rate, it is obvious that their effect can be no more than temporary. For those who are withdrawing their demand from the market because the price appears momentarily high will soon or late want to close their positions, while those who sell foreign money in the expectation that they can later buy it back at a more favourable rate will not be prepared to wait indefinitely for the exchange to rise again. Consequently the exchange rate must eventually be such that the ordinary income and capital accounts of the country concerned balance again.

Comparative Costs

The amount of goods and services which Britain can sell to foreigners depends upon the price of British goods and services relatively to foreign money incomes, given the foreign demand for our goods. If an article costs £1 to produce in England and send across the Atlantic, and it can be sold in the United States for 2·80 dollars, then it is worth exporting (i.e. the American consumer will think it worth buying) so long as the pound is worth 2·80 dollars or less.

Similarly, there will be articles which can be exported when the pound is worth 2·85 dollars or less, some likewise when the pound is worth 2·75 dollars or less, and so forth. Given the English and American price levels, the lower the value of the pound in terms of dollars the more is exported from Britain to America.

The dearer dollars become in terms of pounds, the more expensive are American goods to English people; so that, English money incomes being assumed unchanged, imports from America are discouraged by a fall in the pound relatively to the dollar.

In this way a fall in the pound relatively to the dollar tends at once to stimulate British exports and to discourage imports. Consequently when the exchange rate falls, the items of the income account are changed in such a way that the number of dollars wanted falls and the number of dollars available rises.

Thus equality may once more be reached between demand and supply.

But all this argument presupposes that people in one country are at liberty to buy freely the currencies of other countries and that governments do not intervene to impede the operation in foreign exchange of the laws of supply and demand. That happy state of affairs has existed in few countries outside the U.S.A. since the outbreak of the Second World War (1939).

In the U.K. the buying and selling of foreign exchange has been drastically controlled through the Bank of England, which has maintained detailed records of purchases and sales of foreign exchange by residents of this country.

During most of the time licences to import and export goods have been necessary, and although by the middle of 1955 almost all of these import and export licensing arrangements had been abandoned, transactions in this country involving the exchange of sterling for a foreign currency or vice versa were still fully controlled by the Bank of England. Comparable arrangements existed in most other countries.

Blocked Currencies

During the 1930s the practice of "blocking" currencies was developed, particularly by Nazi Germany in its special trading agreements with the governments of individual countries. This "blocking" meant that the seller of goods to Germany received payment from his own government in his own currency; his government thus accumulated German marks which could be used only for specific purposes.

War-time purchases by the British government and war-time services or facilities granted in various countries resulted in the accumulation of large amounts of "blocked" sterling in different countries. Gradually this has been "freed" by transforming the sterling balance into a loan or by supplying goods or by supplying certain foreign currencies, such as U.S. dollars, Canadian dollars, or Swiss francs.

In nearly all countries the central bank, that is, the bank occupying a position similar to that of the Bank of England in this country, accepts as one of its functions the control of the rate of exchange; and in most countries it does this by a method of foreign exchange licensing, supplemented by numerous agreements with other countries.

The Sterling Area

For the purposes of the control of sterling, which aims at maintaining its value in comparison with other currencies, the countries of the world are divided into various blocs. One is the so-called Sterling Area, comprising all parts of the British Commonwealth except Canada, and, in addition, Burma, Iceland, Iraq, Irish Republic, Jordan, Libya. In all these countries the currency either is the £ or is closely linked with it. Within the Sterling Area sterling or its local equivalent is freely transferable.

The Dollar Area

Another bloc is the Dollar Area. This comprises Canada, the U.S.A., and American dependencies and administrative areas, and practically all the other American republics except Argentina. People in those countries can transfer sterling freely from one to another or to people in almost any other country; but people within the Sterling Area are not permitted, unless specially authorised, to transfer sterling to those resident in the Dollar Area. Virtually all the rest of the world is known as the Transferable Account Area. Here special arrangements exist between the Bank of England and the central bank of the individual countries.

All these arrangements were resorted to because the war shattered the former pattern of international trade and balances of payment, and countries felt compelled to control trading activities in order to protect or rebuild their industries.

Import and export licensing, import quotas, embargoes, and prohibitive import duties make it almost impossible for a country's exports to equal its imports. Anything like a balance of payments can be maintained only through comprehensive bookkeeping, which is undertaken by the central bank in each country.

European Payments Union

An extreme development of this method of account keeping is the European Payments Union, or E.P.U., formed in 1950. After the Second World War individual countries had tried to organize their trade so that their exports to each other's country roughly balanced their imports from it; that is, they practised bilateral trading instead of the multilateral trading customary before the war.

The E.P.U. aimed at restoring multilateral trade by concentrating attention on the member countries' total exports to all other countries and total imports. (*See also* p. 952.)

Economic Co-operation Administration

The Economic Co-operation Administration, the American agency responsible for dispensing the American funds known as Marshall Aid, agreed to provide a sum of $400 million for E.P.U. and more if necessary. Each member of E.P.U. undertook to try to ensure that the total it had to pay to other members collectively should equal the total it had to receive from them. The central bank of each member-country should report monthly to the agent of E.P.U. how much it had to pay to them.

These amounts are all expressed in terms of a common unit of account, equal to the U.S. gold dollar, and an account for each country is prepared, showing how much of balance is due to or from each country as a result of its transactions with all other countries. Some members emerge as debtors, with deficits, others show as creditors, with surpluses.

The E.P.U. is concerned only with these net balances. It aims at keeping them as small as possible. Each member has been assigned a quota equal to 15 per cent. of its total payments and receipts in dealing with all the other members during 1949. The Sterling Area is treated as a single member, and has been given a quota of 1,060 million units out of a total for all quotas of 3,950 million units.

The E.P.U. provides a means for giving credit to its members. A debtor country has a preliminary margin of 20 per cent. of its quota; on the second 20 per cent. it has to pay one-fifth in gold, and it is granted credit for the rest; on the third 20 per cent. it has to pay two-fifths in gold, the rest being a credit; and so on.

Similarly, the first 20 per cent. of the quota of a creditor country is ignored; on any surplus in excess of 20 per cent. of its quota it is paid half in gold and has to grant credit to E.P.U. for the other half. If a member incurs a deficit greater than its quota, the excess has to be paid wholly in gold. These quota rules are applied accumulatively from the commencement of the scheme.

Initially the plan was undertaken for two years only; but it was still operating, with slight modifications, in 1955. During the period from 1950 to April 1955, the U.K. (on behalf of the Sterling Area) had had to pay £99 millions in gold and had been granted £112 million credit; in addition, it had made various bilateral agreements with individual members to offset debits.

While E.P.U. has not succeeded in sweeping away all the governmental restrictions to international trade it has provided an essential basis of credit to encourage trade, and it has been a persistent influence towards freer trade, the abolition of "blocked" currency, and the restoration of convertible currency. The members of the E.P.U. are the Sterling Area, Austria, Belgium, Denmark, French franc countries, Western Germany, Greece, Iceland, Italy, Netherlands, Norway, Portugal, Sweden, Switzerland, and Turkey.

LESSON 8

The Gold Standard

ALTHOUGH paper money has replaced gold currency throughout the world, the idea of the gold standard is still an active force in international monetary affairs. In order to understand much of the discussion at international economic conferences it is necessary for the reader to know something of the gold standard as it has functioned during the 20th century and particularly since 1914.

The gold standard may be briefly described as a series of devices by which the value of the monetary unit in terms of gold (or inversely, the price of gold in terms of monetary units) is maintained practically fixed.

Its chief advantage is derived from the fact that if other countries likewise maintain a gold standard (fixing the value of their monetary units in terms of gold), the value of the monetary unit of the first country is approximately fixed in terms of the monetary units of other countries.

That is to say, if the pound sterling bears a fixed relation to gold, and the U.S.A. dollar bears a fixed relation to gold, then the pound sterling bears a fixed relation to the U.S.A. dollar. Likewise, if the French franc, the Dutch florin, the Swiss franc, and the German mark all have a fixed price in terms of gold, then their prices in terms of one another are approximately fixed.

In practice there are several kinds of gold standards. Under the "full" gold standard, in operation in the U.K. from 1816 to the outbreak of the First World War in 1914, anyone could present a bank note at the Bank of England and demand gold sovereigns or half-sovereigns in exchange.

Gold coins, sovereigns, and half-sovereigns were standard money and in everyday circulation. Gold bullion could be freely bought, imported, and exported. Persons taking gold bullion to the Bank of England could have it coined free; and the Bank of England was required to buy any gold offered to it at the price of £3 17s. 9d. per standard troy oz. (i.e. gold $\frac{11}{12}$ or 22 carat fine), and to sell it at £3 17s. 10½d. At this price the 123¼ (123.27447 to be exact) grains of standard gold in a sovereign were worth exactly £1.

The Gold Bullion Standard

When Britain "returned to the gold standard" in 1925 the full gold standard was not restored; instead, there was what is called the gold bullion standard.

Under this arrangement the Bank of England was no longer required to redeem its notes in gold coins, which had been out of use since 1914 and were not restored; and the right of free coinage of gold bullion was also abrogated.

All that the Bank was now required to do was to supply gold bullion, in the shape of bars of gold containing approximately 400 oz. troy of fine gold, to anyone paying the same price as before, viz. £3 17s. 10½d. per oz.

The importation and exportation of gold was still permitted; and the fact that gold was available only in bars costing about £1,400 apiece was no hindrance, since international gold payments were usually for large amounts.

This system continued until September 1931, when Britain "went off" gold: the gold standard was then suspended. The chief legal effect of this was that the Bank of England was freed from its obligation to sell gold bars at a fixed price. The importation and exportation of gold were still allowed, but it had to be bought in the London bullion market; it could not be bought from the Bank.

When gold ceases to be available at a fixed price for export—either by the suspension of the obligation to sell gold at a fixed price or by a ban on its export—the country concerned "goes off the gold standard". It may also "go off the gold standard" in the other direction.

The latter happens when, in the face of a great influx of gold, the monetary authority refuses to receive gold at the fixed price. There being an abundance of gold which the monetary authority refuses to buy at the fixed price, the price of gold in terms of the country's monetary unit sinks.

Gold Export Price

Consider the conditions which existed in the years 1925–31. Then gold could be obtained in London at a known price in sterling and shipped to New York, where it could be sold for a known price in dollars. The British law (when Britain was on a gold standard) said that gold for export could always be obtained from the Bank of England at a price which equalled one pound troy of standard gold for £46 14s. 6d.

The American gold standard law provided that a 10-dollar piece should contain 258 grains of gold $\frac{9}{10}$ths fine. The mint par of exchange between the British pound and the U.S. dollar was \$4·866 = £1, i.e. there was as much fine gold in 4·866 dollars as in a gold sovereign.

Suppose the cost of shipping and insuring shipment of £100 of gold from London to New York to be 2 dollars; then it can be shown that the price of a pound in terms of dollars could not under those conditions fall below about 4·86.

For at that price it became profitable for a person holding £100,000 and wanting dollars to use his £100,000 to buy gold in London send the gold to New York (at a cost of 2,000 dollars), and sell it there (obtaining 486,600 dollars).

In this way he obtained for his £100,000 a net amount of 484,600 dollars (486,600 less the 2,000 dollars which he had to pay for shipping the gold). Thus he could obtain more dollars than he would have done by merely buying dollars in the foreign exchange market, since there he would have received 4·86 × 100,000 less 2,000 dollars (484,000).

There were always in fact special dealers ready to initiate these gold movements as soon as a profit showed. Consequently the exchange never could, when both countries were on a gold standard, fall below this *gold export point*, which was determined by the fixed prices of gold at the banks in the two centres and the cost of sending gold across the Atlantic. Any excess of demand for dollars over the supply of dollars could always be met in this way.

In a similar way, when the demand for pounds was in excess, the exchange would rise to a *gold import point* at which it became profitable to dispose of the excess dollars in New York in exchange for gold which could be shipped to England and sold for sterling at a known price.

If the balance was against the country concerned, gold would be demanded in exchange for the national money, to provide for the export of gold. This was broadly true even when there was a circulation of gold sovereigns, as relatively slight price movements do not usually stimulate people to change the amount of money they wish to hold for day-to-day payments.

The entire burden of providing gold for export therefore fell, in the U.K., on the Bank of England. The exchange dealers who arranged the gold shipments would draw Bank of England notes from the joint stock banks (or the Banking Department of the Bank of England if they were customers of the Bank of England). The joint stock banks would then obtain the notes by reducing their balances with the Bank of England (the Bankers' Deposits of the Banking Department).

Thus in any event the notes held by the Banking Department and the Deposits (either Bankers' or Other Deposits) in the Banking Department were reduced by an exactly equal amount.

The notes withdrawn by the exchange dealers were presented to the Issue Department for redemption in gold, under the Gold Standard law, and the gold could then be shipped. The notes handed in at the Issue Department had to be cancelled at once—the Issue Department could hold none of its own notes.

If the disequilibrium in the balance of payments was purely temporary, the Bank of England might be prepared to allow the gold held in the Issue Department and the reserve of notes

held in the Banking Department to be reduced somewhat, without taking any steps. If the disequilibrium was of a more lasting nature, the Bank of England would be forced to act in order to avoid the complete exhaustion of the reserve in the Banking Department and a continued drain of gold from the Issue Department.

High and Low Bank Rates

The action it usually took was the raising of bank rate in the manner described in Lesson 5. The raising of bank rate, with its consequential rise in the rate of interest paid on money placed on deposit and charged for loans, made London a more profitable place for lending than it was before, and a dearer place for borrowers.

Consequently, firms holding large sums in New York or Amsterdam, or in other important financial centres, might decide that, the interest rates in London being higher now, they would move their balances from New York or Amsterdam to London, placing them on deposit there. This movement of "short-term funds," or "short money," from foreign centres to London necessarily involved the sale of foreign money to purchase sterling. At the same time borrowers in London saw that they could borrow on better terms elsewhere, and repaid their London debts on the due date.

In order to secure the necessary funds for repayment they borrowed in foreign centres, using the foreign money to buy sterling in the foreign exchange market. Thus there was created a twofold increase in the demand for sterling: foreign borrowers were paying off their London debts, while lenders in London were increasing their loans in foreign centres.

In this way quite a large temporary deficit in the balance of payments could be offset without there being any need for further shipments of gold to redress the balance. This effect of a rise in bank rate was immediate, and served to redress the balance of payments only in the period immediately following the change.

In addition to these direct effects in redressing immediately the balance of payments, bank rate operated on the internal situation. A high bank rate, by deterring capital development, tended to depress employment and prices. A low bank rate tended to stimulate capital development, thus causing a rise in prices as the factors of production became more in demand.

When, as a result of a high bank rate, prices in Britain fell relatively to prices abroad, Britain became a more profitable country to buy in - foreigners with money incomes unchanged could buy more of English products than before. Consequently exports were stimulated.

At the same time, the depression of money incomes in the U.K. (by unemployment and lower wage-rates and lower profits), while foreign prices remained unchanged, made foreign products relatively dear in the U.K. Imports were consequently deterred. The fall in the British price level relatively to price levels outside thus tended to create a more favourable balance of trade.

The demand for sterling was therefore increased relatively to the supply of it. The demand for sterling and the supply of sterling might in this way be brought to equality, without there being any need for movement of gold to offset an otherwise uncovered deficit of supply.

Import of Gold

Consider the reverse case. Suppose that the balance of payments was for some reason - say, an increased foreign demand for British goods - very favourable to the U.K. Then foreigners would, at the existing rate of exchange, require more sterling to settle their debts (debts created by purchase of British goods, chartering of British ships, loans obtained in London, etc.) than there was sterling available in the foreign exchange market, as a result of British requirements for settling the claims of foreigners who had sent goods, etc., to the U.K.

The value of sterling in the foreign exchange market then rose until it became profitable to use foreign money to buy gold in Paris, New York, Amsterdam, or elsewhere, ship the gold to London, and obtain sterling by selling the gold to the Bank of England.

The import of gold into the U.K. in this manner became profitable when the foreign exchange value of sterling reached the gold import point. Once that point was reached, all the excess demands for sterling could be satisfied by the shipment of gold to London.

This influx of gold might be merely temporary, in which case the Bank of England would merely use the gold to increase its reserve. But if the gold influx was regarded as having its origin in some permanent change in the trading position of this country, then bank rate was reduced, and the tendency for all discount rates in the London money market to fall would be consolidated instead of being averted by the Bank's action (as when the gold influx was considered temporary).

London was then a more attractive centre for borrowers and a less attractive centre for lenders. The excess demand for sterling was absorbed in the immediate future by the tendency of short funds to move to foreign centres, and the gold influx was therefore suspended at once. At the same time, the bank rate reduction began to stimulate economic activity inside the country. U.K. prices tended to rise relatively to foreign.

Foreigners therefore reduced their purchases of U.K. goods. U.K. exports declined. At the same time, people in Britain found that they

could buy more foreign goods—U.K. imports increased. This twofold change in the foreign trade balance of the U.K. restored to a true balance at the existing rate of exchange the demand for and the supply of sterling in the foreign exchange market. Equilibrium, as the economists say, was restored.

The First World War brought this system to an end; but the international gold standard had been so highly regarded by the commercial and financial world that its suspension during the war period was almost universally regarded as a necessary evil of war-time, to be terminated as soon as possible after the restoration of peace.

The restoration of the gold standard was accordingly the aim of English monetary policy from the end of the war onwards, although the deep depression of business in 1922 caused some hesitation. In the spring of 1925, however, the pre-war gold parity was restored.

Not without some opposition, however, from some leading economists, including Keynes, who contended that the return to the pre-war parity would over-value the pound sterling in the foreign exchange markets, thus intensifying the depression of U.K. export trades and the pressure of unemployment. They further suggested that it would be better to leave the gold standard alone—reject it as a "barbarous relic"—and "manage" the pound sterling as an independent currency.

The orthodox financiers triumphed. There was no very serious public debate on the issue, 4·86 or 4·40 (the issue of the appropriate parity at which the U.K. should return to the gold standard). The authorities were unanimous in deciding to return to the pre-parity with gold.

This end was achieved by the Bank of England's resuming its pre-1914 obligation to buy gold at the fixed price of £3 17s. 9d. per standard ounce, and to sell gold at the fixed price of £3 17s. 10½d. per standard ounce, while the government removed the restrictions on the export of gold. The revival of the *status quo* in the U.K. involved the restoration of the pre-war exchange rate of \$4·86 = £1.

The enforcement of this exchange rate on the market in 1925 had serious consequences for the U.K. export trades, for during the previous year the exchange rate had been round about 4·40 dollars = £1. The forcing up of the exchange rate very quickly reversed the tendency to recovery. For if it costs £1 to make a pair of shoes in Britain and ship them across the Atlantic, the business is worth undertaking if the price which the shoes will fetch in America is at least equal to the amount in dollars which is needed to buy £1 in the foreign exchange market.

Suppose that the price which the shoes will fetch in America is 4·40 dollars, then the business is worth undertaking so long as the 4·40 dollars can be exchanged for £1 or more. At the exchange rate of 4·40 dollars = £1 the shoe exporter can just cover his costs.

But suppose that the exchange rate is raised to 4·86 dollars = £1. Then the shoe exporter finds that his 4·40 dollars, instead of being the means of obtaining the £1 necessary to cover his costs can be sold for about eighteen shillings only. The exports can no longer be profitably made, unless one of two things happens—either the American prices must rise or the British costs must fall. Otherwise exports from the U.K. to America must decline.

Balance of Trade Out of Gear

The artificial raising of the value of the British pound in the foreign exchange markets of the world tended in this manner to restrict U.K. exports to all parts of the world. It had the effect not only of hindering exports but also of encouraging imports. For the American and Continental producers found that when they sold goods in the U.K. and realized the proceeds in the foreign exchange market, their receipts in their own currencies were increased by the raising of the foreign exchange value of the pound sterling.

U.K. costs, meanwhile, did not change. The British producers were therefore faced with more acute competition from abroad. Hence imports grew, while home producers were ever more clamorous for Protection. Thus from two sides the raising of the exchange rate threw the balance of trade out of gear.

It had been said that the U.K. must return to the gold standard in order to maintain her lucrative position as the financial centre of the world. But it would have been possible to return to the gold standard at some parity other than the pre-1914 parity of 4·86 dollars = £1. Such a course was not seriously considered by the authorities; apparently they expected U.K. costs to fall and world prices to rise.

Throughout the period great stress was laid on the possibility of reducing costs by making industry more efficient. Great strides were made in improving industrial technique; but that was not sufficient. For other countries were also improving their methods, and the producer in the U.K. could retrieve his position only by increasing his efficiency more rapidly than his foreign rivals could increase their efficiency.

The other possibility for relieving the U.K. economic situation—a rise in world prices—also did not materialise. The years following 1925 were therefore years of unfavourable trade balances for Britain.

The U.K. succeeded in maintaining the gold standard through those years by curtailing loans to foreigners (an "old" country normally

lends large amounts every year to "new" countries) and by attracting foreign short-term funds to London. Already in 1929, however, the position was rapidly deteriorating, and the collapse of the American boom made matters infinitely worse.

Wall Street Crash

The pricking of the prosperity bubble in America, evidenced in the crash of security prices on Wall Street (where the New York Stock Exchange is situated), proved to be the prelude to a complete collapse of new industrial activity. Unemployment mounted rapidly, as those at first thrown out of work had to cut down their consumption of the products of other industries; by 1933 unemployment in the U.S.A. had reached twelve to fifteen millions.

In Europe the end of the American boom led to the breakdown of monetary systems. Money incomes in the U.S.A. had been raised by the inflationary boom conditions, and this factor had combined with sporadic American investment abroad to support Europe in a state of moderate prosperity, while the U.K. situation had remained relatively unchanged in the face of a steady deterioration in the fundamentals of Britain's position.

American investment abroad had already ceased in the latter days of the boom; such funds as were realizable had been called back so that they might be employed in stock exchange speculation. Now the boom itself disappeared. Both supports to the economies of the U.K. and the Continental countries were gone. Austria was the first to suffer a serious crisis. The collapse of one of the largest banking institutions (the Credit Anstalt) in 1931 was the signal for a widespread "run" on banks throughout Central Europe.

Standstill Agreements

The run was of immense international importance, as much of the American- and even British- lending to Central Europe had taken the shape of funds placed on deposit in the ordinary way (though often in terms of the lenders' currency).

These American and other foreign depositors no sooner saw that some important Central European banks were in difficulties than they very naturally attempted to withdraw their deposits from *all* Central European banks. Their demands could not be met, as the cash of the kinds they wanted did not exist in sufficient quantities.

The Bank of England made loans to the banking systems of Germany and Austria; but the amounts demanded were such that almost all the German and Austrian banks had to close their doors for a short time, and eventually the foreign financiers had to face the inevitable and agree to leave by far the greater part of their money in Central Europe. (The agreements made were called the "standstill agreements.") These agreements, and the steps which the Central European authorities took at the same time to supplement the arrangements with foreign bankers, involved a virtual suspension of the gold standard by the countries concerned.

Unrealizable Assets

While all this was happening in the summer of 1931 Britain was experiencing difficulty owing to the effects of the world depression on her export trades; but the position was not acute. Although all three of the major credit items in the U.K.'s international account - exports of goods, income from previous foreign investments, and shipping earnings had declined the U.K. had benefited from the enormous fal in the prices of goods and raw materials- which were of course the principal items on the debit side of the international account.

Events on the Continent had, however, a disturbing effect, for British bankers—among them the Bank of England—now found themselves saddled with unrealizable assets in Central Europe The liquidity of the banking system of the U.K. was inevitably questioned.

Continental financiers began withdrawing the substantial funds which they had deposited in London, at a time when the U.K.'s balance of payments was further deteriorating as a result of fresh defaults by debtors.

The Bank of England had been obliged to borrow a large sum from Paris and New York - a sum which was exhausted within a few weeks and which was followed by a further loan (making a total of £130,000,000) to the British Treasury, again from New York and Paris.

A little later it was announced that these credits were almost exhausted—so rapid had been the withdrawal of funds. The news precipitated a panic "flight from the pound," which obliged the authorities to depart from the gold standard. Part of the Gold Standard Act of 1925 was suspended in September 1931.

From that date onwards it was impossible to obtain gold from the Bank of England at the fixed price. The sterling demand for foreign currencies had therefore all to be settled directly in the foreign exchange market; and under the pressure of great sales of sterling the pound declined to about two-thirds of its former gold value in the next three months.

The fall in the value of sterling gave some advantage to British exporters. Their costs in sterling remained approximately unchanged, while the fall in the value of sterling enabled them to quote lower prices in foreign currencies. (A trader who could formerly cover his costs by selling at 5 dollars could now do so by selling at 4 dollars, the value of dollars in English money

having risen.) This stimulus was felt especially in the U.K.'s oriental markets, until Japan departed from the gold standard in December 1931 and her currency fell even lower than the £.

As the world depression deepened and other countries followed the U.K. off the gold standard, the advantage to Britain's export trades disappeared ; but the increased cost of imports combined with the new import duties to such an extent that the U.K. balance of trade was greatly improved, despite the renewed decline in the value of exports and other credit items.

France, Holland, Switzerland, and Belgium combined to form a "gold bloc," but in 1936 Holland abandoned the gold standard, and France and Switzerland, while nominally on gold, devalued their currencies. There was another depreciation of the French franc in 1937. The outbreak of war in September 1939 made the gold standard a matter of history.

LESSON 9

Britain's Managed Currency in Peace and War

EVENTS having justified the first contention of Keynes and his fellow economists of 1925, most people immediately assumed that their second contention - that the U.K. should leave the gold standard entirely alone as a barbarous relic had also been justified by events. Opinion was therefore antagonistic to a return to the gold standard, and the pound sterling became and remained a "managed currency."

World Price Level

As already pointed out, under gold standard conditions the price and income structure of the country was tied to the world price level by the need to maintain the foreign exchanges. If the U.K. wished to keep unchanged the value of her money in terms of the moneys of other countries, the U.K. price level had to follow that of other countries upwards or downwards, so long as the conditions of international trade remained unchanged.

Such upward or downward movements of prices had sometimes very disturbing effects, and those who objected to the gold standard rightly pointed to these disturbances as disadvantages of a gold standard. But it was pointed out that disturbance of the internal price level might also be necessitated by another kind of change.

If the general world price level remained unchanged, but the world's demand for British products changed, then the U.K. price level, under gold standard conditions, had to fall or rise, according to whether the world demand for her products had decreased or increased. This again was a serious disadvantage of the gold standard, which was more important after 1925 than the general movement of world prices.

A managed currency is designed to avoid these disadvantages. There being no necessity for the foreign exchange value of the currency to remain stable, changes in the relevant world conditions may be experienced as changes in the foreign exchange rate, rather than as changes in the internal price level.

The internal price level is "insulated" against changes in the outside world by a foreign exchange rate which is free to vary. The monetary authorities are then free to manipulate the internal price level by the operation of bank rate, in the way which they consider most conducive to industrial prosperity.

The disadvantages of such a system are as follows. First, the variability of the foreign exchange rates constitutes an element of uncertainty in foreign trade and all kinds of overseas business. Secondly, the uncertainty of the future exchange rate creates the danger that the currency may become a prey to speculators who can at least increase the variability of the exchange rate (and therefore increase traders' risks), and at worst undermine confidence and lead to a panic which, by putting the situation beyond the control of the authorities, upsets the internal situation far more than gold standard conditions ever did.

The former disadvantage is the more serious for a country which is largely dependent on international business for its livelihood ; while the second is the more serious for a country where the authorities are not sufficiently strong to inspire confidence in the world at large.

The Exchange Equalisation Fund

After the spring of 1932 the British government devised a plan for meeting the second difficulty. This device was the Exchange Equalisation Fund, amounting to £575 millions, used to buy gold currencies when the demand for pounds was great, thus moderating the rise. Then, when there were unusually large sales of sterling, the foreign currencies in the Fund were sold in the market for pounds, thus checking the fall in the value of pounds.

The aim was not to prevent all changes in the foreign exchange rates but to offset short-lived speculative movements which would otherwise

have rendered the course of the exchanges erratic and the market subject to wild gains and losses of confidence. The benefit which the U.K. enjoyed from the existence of the Exchange Equalisation Fund is seen in the difference in the extent of the dislocation caused throughout the country by the crisis of 1931 and those crises through which the U.K. passed in September 1938 and later.

In September 1939 the gold reserve in the Issue Department of the Bank of England was transferred to the Exchange Equalisation Fund. The value of the gold transferred—at the price of 168s. per oz.—was approx. £279 millions. The fiduciary issue of notes was correspondingly increased from £300 to £580 millions.

Bank for International Settlements

One of the most interesting developments in the sphere of international finance in those years of crisis was the establishment in 1930 of the Bank for International Settlements, at Basle, in Switzerland.

The primary duty of the B.I.S. was to collect and distribute the annuities paid by Germany on account of reparations to the Allies as scaled down in the Young Plan of 1929; a second function was to act as a clearing-house for international debts generally.

Debts owed by one European country to another might be settled by mere entries in the new bank's books; and when these had been cleared, it was anticipated that payments would be made by the B.I.S. to the U.S.A. in respect of the First World War debt owed by the European victor-powers to their former associate across the Atlantic.

Assistance to Central Banks

But these functions did not exhaust the Bank's possibilities: there were some who saw in it the germ of an international organization that would be of immense assistance to the central banks and international finance generally. The governors of the principal central banks could meet regularly and as a matter of course at the monthly board meetings of the B.I.S.

The Bank might act as a clearing-house for central banks by virtue of its powers of holding gold earmarked to their individual credit, the gold being readily transferable from one central bank to another without physical movement but as mere book entries.

Another direction in which the Bank might profitably work was towards active participation in monetary affairs in different markets with a view to achieving equilibrium by the international movement of funds. Finally, it was anticipated that the B.I.S. might do much to stabilise the value of gold—indeed, even render gold largely unnecessary in international finance by lending, discounting bills, and buying securities in much the same way as a central bank in its own country, but with the advantage that it would not be bound by any statutory or customary gold ratios. Although the B.I.S. did not achieve its objects, it is still functioning as the agent for the European Payments Union.

Second World War

Britain's monetary system was still a "managed" one when the outbreak of the Second World War in 1939 made further regulation imperative. The support of the Exchange Equalisation Fund was withdrawn from sterling in August of that year, allowing the rate to depreciate sharply in terms of dollars, so as to conserve the country's stock of gold. The sterling rate at once depreciated to \$4·35, and in mid-September it was at one time \$3·75. A still lower level was reached on May 10 the next year (1940), when the sterling-dollar rate touched \$3.

On August 27, 1939, the Treasury prohibited dealings in foreign securities without Treasury permission, and owners of securities on which dividends were payable in certain foreign currencies were prohibited from selling, etc., them, and were required to make a return of their holdings to the Bank of England.

In due course a great quantity of these foreign securities, notably the stock of certain leading U.S. corporations, were "mobilised" in aid of the national war effort, i.e. they were compulsorily acquired by the Treasury and sold to American buyers in return for much-needed dollars.

Treasury Supervision

Following the collapse of France and the Low Countries in 1940 all exports to the U.S.A. and Switzerland, the only remaining countries where the exchanges were still free, had to be paid for in sterling obtained only from the Exchange Control at official rates, or in U.S. dollars or Swiss francs; transactions with other countries were effected in sterling obtained similarly through official channels at official rates. In a word, the whole export and import trade of the country came under the financial supervision of the Treasury, while the Board of Trade concerned itself with the actual goods that were allowed to pass. This system continued throughout the war.

In October 1943, Belgium, Luxemburg, and Holland drew up a payments agreement which had in view the conditions which might obtain when hostilities ceased. It was, in fact, the first agreement concluded for the purpose of facilitating peace-time monetary relations. Almost a year passed before this example was followed. But in the autumn of 1944 and in 1945 new agreements came rapidly. The U.K. itself was concerned with a round dozen.

There was a distinct uniformity in the general structure of the agreements, deviation being introduced only to fit in with the special circumstances affecting individual countries. In each agreement a clause was inserted to the effect that if either of the contracting governments should adhere to a general international and monetary agreement, the terms of their own particular arrangement would be reconsidered.

The reason for this was a desire to keep the way open for possible adherence to the proposals which emerged from the United Nations' Monetary and Financial Conference held at Bretton Woods, U.S.A., in July 1944.

LESSON 10

The Bretton Woods Plan

FROM July 1 to 22, 1944, the representatives of 44 nations deliberated at Bretton Woods, New Hampshire, U.S.A., and produced a plan which, while containing many debatable points, remains the most constructive effort on the part of international experts to set up the framework of an international monetary system.

This was to combine reasonable long-term stability of exchange rates and gold prices with a certain elasticity in case of need and, while envisaging the removal of exchange restrictions and control, at the same time to limit the purposes for which exchange might be freely bought and sold.

International Monetary Fund

The basis of the plan was that the currency of each member country should be given a "par value" in terms of gold as a common denominator, or in terms of the U.S. dollar, which is, of course, linked to gold. The "gold motif" runs through the whole of the scheme, but the object of the International Monetary Fund which was established is to substitute for the largely self-operating gold standard—to the rigid discipline of which many nations will no longer subject themselves—a code of rules for the orderly conduct of international exchange.

The Articles of the International Monetary Fund, with the corollary agreement of the International Bank, represent an attempt to create this orderly mechanism.

The scheme may be summarised as follows. An International Monetary Fund was set up which, for the allied and associated nations, amounted to $8,800,000,000. A quota was fixed for each member to subscribe to the "pool of exchange" created for the Fund. Members of the Fund acquired rights and incurred certain obligations. Each membership fee was determined by a member's quota.

Each member had to deposit with the Fund an amount in gold equal to either 25 per cent. of its quota or 10 per cent. of its net official holdings of gold and U.S. dollars, whichever was the smaller. The difference up to the full quota had to be paid to the Fund in the currency of the member.

Thus the International Monetary Fund possesses a reserve of international money—i.e. gold and free foreign exchange and a credit in the currency of each member country which can be lent to any other member country.

A country developing an adverse balance of payments need not take immediate steps to remedy that defect by imposing exchange controls, etc., but may, within limits and subject to certain safeguards, borrow the necessary foreign exchange from the Fund. The borrowing member gives the Fund the equivalent in its own currency.

Applications to the Fund for assistance can emanate only from the Treasury, the Central Bank, the Stabilisation Fund, or other fiscal agency of the borrowing member. The Fund has no direct dealings with the exchange markets. Nominally the borrowing member cannot borrow more than 25 per cent. of its quota in any single year, nor can it, without special permission, continue borrowing so as to cause the Fund's holding of its currency to exceed 200 per cent. of its quota.

All trading in gold and exchange between members is on the basis of the par values, plus or minus prescribed margins; in the case of gold the margins have to be prescribed by the Fund; in the case of spot exchange transactions a maximum of 1 per cent. is fixed.

The Pound Devalued

Any member has the right to depart from its gold parity by 10 per cent. without objection from the Fund, and if a further change not exceeding 10 per cent. is sought the Fund may concur or object, but the decision must be given within 72 hours. If, however, a more far-reaching change is proposed, the Fund is entitled to a longer period in which to give its answer, but it must concur if it is satisfied the change is essential to correct a fundamental disequilibrium. In 1949 the British government took advantage of this provision and devalued the £ from the equivalent of $4·03 to $2·80.

An interesting innovation is that in certain circumstances uniform changes in the par values of all currencies are possible. This means that the price of gold might be changed all round in order presumably to mitigate either a scarcity or a redundancy in the supply of gold and thus to promote a greater stability of commodity prices.

The resources of the Fund cannot be used to meet a large or sustained outflow of capital. There are, of course, several other principles laid down, rules of procedure, charges payable for facilities granted, etc.

Reconstruction and Development

The creation of an International Bank of Reconstruction and Development was conceived as an essential adjunct of the International Monetary Fund. The Bank was instituted to meet the long-term credit requirements of member countries which could not obtain capital for legitimate reconstruction and development, by the provision of foreign currencies which members could not secure independently or at reasonable rates of interest.

The Bank particularly aims at helping the needy and less developed countries (e.g. Austria, Turkey, Brazil, Italy). It has also sought to promote along with the International Fund the long-range balanced growth of international trade; to maintain equilibrium in the balance of payments, to raise productivity; standards of living, and labour conditions; and to assist in bringing about a smooth transition from a war-time to a peace-time economy.

All members of the Bank must be members of the International Monetary Fund. The maximum authorised capital is \$10,000,000,000, of which the Bretton Woods nations subscribed \$9,100,000,000 in amounts, with one or two exceptions, proportionate to their quotas under the Fund. Only 20 per cent. of subscriptions was immediately allotted, of which 8 per cent. was payable in gold and the balance in national currency 8 per cent. within a year and 12 per cent. as and when needed. The remaining 80 per cent. constitutes a contingent liability to be called only if required to meet losses.

Three kinds of operations are undertaken by the Bank : (1) participations in direct loans from the Loan Fund ; (2) the granting of or participation in direct loans by means of funds obtained through borrowing thus borrowing in one country or market and lending elsewhere ; (3) guaranteeing, in whole or in part, loans made through the ordinary channels of private international investment. Important provisions regulate the Bank's use of any funds at its disposal as well as its power to deal with defaults or to modify the terms of loan contracts.

The World Bank is on the whole less extensive in scope than the Monetary Fund, less novel and contentious in theory, and less at variance with accepted banking and investment practices. Finally, the success of the Fund and the Bank plan depends upon the spirit in which they are carried out by the governing and executive boards, as well as upon the behaviour of governments.

LESSON 11

Marshall Aid and European Recovery

It remains to consider the origins and some of the effects of Marshall Aid, so powerful an influence in the re-building of the economic and financial life of Europe.

Between 1939 and 1946 exchange control in the U.K. was operated by statutory rules and orders issued under the Defence (Finance) Regulations. With the end of the war a change became necessary in the sterling area mechanism. In March 1947 control of the sterling exchange lost its war-time trappings and became a permanent part of the peace-time financial set-up when the Exchange Control Act was passed.

In itself this made no material differences in the machinery of control, other than in the sections dealing with securities, where concessions in certain directions were counter-balanced by a tightening of the screw in others.

The U.S.A. disliked and suspected the discriminatory twist which force of circumstances had given to the sterling area mechanism during the war. Hence the most notable departure from Britain's war-time practice was brought about by the terms of the agreement accepted under the Anglo-American Loan Agreement of December 1945, by which the U.K. obtained a credit line of \$3,750,000,000. This lay in the removal of control over "current" exchange transactions. This the U.K. undertook to achieve one year after ratification of the agreement by both countries.

Transferable Accounts

In preparing to meet additional commitments under the terms of that loan agreement, the British government entered into a series of agreements to tie up the loose ends as far as possible. This drive to implement Britain's bargain reached its peak in the first half of July 1947, on the completion of new financial and payments agreements with most of the principal trading nations in the world.

Hence, a few days before the dead-line date, July 15, 1947, the British government was able to inform the U.S.A. that so far as it was practicable to do so, Britain had fulfilled her obligations to make "*currently accruing sterling available for current payments*" in any part of the world. This was actually achieved by the

device known as Transferable Accounts. The result of this series of agreements was to divide the world, so far as British overseas payments were concerned, into three main currency areas. These were (*a*) American account countries, which included U.S.A., all Latin-American countries (except Brazil, Uruguay, Paraguay, and Argentina), the Philippines, and U.S. dependencies; (*b*) Sterling Area accounts, which included the British Commonwealth (except Canada and Newfoundland), British Mandated Territories, British Protectorates and Protected States, Iraq, Iceland, and the Faroes; and (*c*) other countries. Later Egypt, the Anglo-Egyptian Sudan (as it was then called), Palestine, Jordan, and the Faroes left the Sterling Area. But Burma was added to the schedule.

Unhappily the U.K. powers of recovery had been overestimated, while factors beyond her control worked strongly against her. In the event, convertibility of sterling could be maintained for little more than a month, partly because sterling became a medium for the acquisition of dollars by people who, for one reason or another, preferred them to pounds, and many of whom were suffering, like the U.K., from a shortage of currently earned dollars.

The drain on Bank of England gold and dollars was severe and very substantial drafts were made on her American and Canadian credit lines. It was at this time that Britain had her own serious internal crisis, as the Dalton cheap-money policy proved a failure.

The Scheduled Territories

A situation then developed in which Great Britain remained the centre of a group of countries, commonly described as the "Scheduled Territories" the title substituted in the Exchange Control Act for the "Sterling Area" -- within which exchange transactions were almost entirely unregulated.

Exchange relations with countries outside the area had to be re-arranged by a new series of agreements embodying severely modified rights of "transferability." In several of these agreements, clauses were inserted requiring automatic adjustment of outstanding liabilities, arising as a rule out of current trade, in the event of alterations of exchange parities.

Meanwhile the dollar exchange rate, and the parity with gold as declared to the International Monetary Fund, remained fixed. The essentials of exchange control, especially over capital transactions, remained. The Bretton Woods system was still the standard and the objective of exchange policy and arrangements; but events of the summer of 1947 constituted a serious setback in the movement towards restoration of a freely moving international exchange system. The U.K. was thrust back upon a "siege economy," trading reverted to the bi-lateral mould, and the European and world trading situation generally deteriorated.

A series of events had been set in train as a result of a proposal put forward by General Marshall, United States Secretary of State, in which he outlined a scheme of economic help by the U.S.A. to the countries of Europe.

The European Recovery Programme

In the U.S.A. the scheme became known officially as the European Recovery Programme (E.R.P.). The legislation by which it was implemented was called the Foreign Assistance Act, which received the President's signature on April 3, 1948.

The European nations were quick to respond to this American offer and plans went ahead rapidly. On July 12, 1948, representatives of 16 nations met in Paris as the Organisation of European Economic Co-operation (O.E.E.C.). Their report drew up a programme which set production targets, calculated the dollar deficit in their balance of payments over the period of four years from 1948 to 1951, and stressed the need for monetary stability and closer integration of European industry.

The bill presented to the U.S. Congress in its original version called for an appropriation of $17,000,000,000 to cover the period April 1, 1948, to June 30, 1952. At an early stage in the debate the requested appropriation was cut down to $5,300,000,000 to cover the first 12 months of E.R.P.

The act set up the Economic Co-operation Administration (E.C.A.) as a new agency of the U.S. government and an administrator was appointed who was responsible directly to the President. His responsibility was to determine how the funds appropriated by Congress were allotted among the participants and what form the assistance took, i.e., whether it was to consist of repayment loans (and, if so, on what terms) or of outright gifts.

Each recipient country was required to negotiate a separate bi-lateral agreement with the U.S.A. and to pledge itself to fulfil seven conditions. These were to assure that each country worked actively for independence from external, abnormal economic aid, and included requirements for increased production; monetary stability; reduction of trade barriers; efficient use of resources, including U.S.A. aid; production of raw materials for U.S.A. stockpile; establishment of special accounts by the Central Bank to show how the aid was used; and publication of appropriate information.

On April 16, 1948, E.R.P. was launched in Europe with the signature in Paris of the Charter of the O.E.E.C., by which the 19 countries undertook to achieve the general objectives of the European Recovery Programme. The Four-Year Plan for the Western European

"bloc" was produced before the close of the year. On October 16, 1948, these countries signed the intra-European payments and compensations agreement, by which a new system for settling differences in balances of payments was devised.

It should be repeated here that the complex machinery set up is part of the Marshall Aid plan and is directly linked with the amount of aid made available by the U.S.A. through E.C.A. grants.

European Payments Union in Action

As stated earlier, a first step towards multilateral compensation was taken in November 1947 between the governments of Belgium, Luxemburg, France, Italy, and the Netherlands, with other countries, including the U.K., adhering as "occasional" members. This proved disappointing in its achievements because of the continuing disequilibrium in the pattern of intra-European trade.

Obviously, therefore, new financial resources had to be raised and it was equally obvious that these additional resources became inextricably linked with the allocation of Marshall Aid. After prolonged and complicated negotiations the member countries drew up a plan which provided for an agreed distribution among themselves of the £4,875,000,000 of Marshall Aid available to the European countries for the 12 months to June 30, 1949, and at the same time linked this allocation with the new intra-European payments scheme. The basic principle of the scheme was that surpluses and deficits arising from intra-European trade should be given away in the form of contributions by the creditors and taken as gifts in the form of "drawing rights" by the debtors. This plan was not as successful as had been hoped, principally because it was bi-lateral in character: the settlements were between individual countries. It was soon superseded by the European Payments Union, multilateral in intention and its organization.

The immensity of Marshall Aid can be judged from the fact that economic aid to Europe during the years 1946 1953 amounted to more than $23,000 millions; in addition, $5 3 millions were lent and nearly $10,000 millions provided as military aid. Areas outside Europe were also extensively helped.

Apart from its direct effect in stimulating industry and trade in the war-devastated areas of Europe, Marshall Aid led to the creation of organizations of economic co-operation that in themselves still foster international trade; and it was a powerful influence towards greater efficiency in production and greater effectiveness in international exchange.

The European Payments Union (*see also* p. 941) is a means by which eventually the member countries may be able to return to currencies freely convertible and to multilateral trade.

BOOK LIST

General *How Money is Managed*, P. Einzig (Pelican); *Money*, Geoffrey Crowther (Nelson); *Money: Its Present and Future*, G D H Cole (Cassell); *Modern Banking*, R S. Sayers (O U.P.); *British Public Finances: Their Structure and Development, 1880 1952*, U. K Hicks (O U P); *The Stock Exchange: Its History and How it Works: Its Place in the Modern World*, W. T. C. King (George Allen & Unwin)

Current Official Papers *Annual Report of the Bank of England*; *Annual Economic Survey*; *Annual Report of the International Monetary Fund*; *Annual Report of the International Bank*.

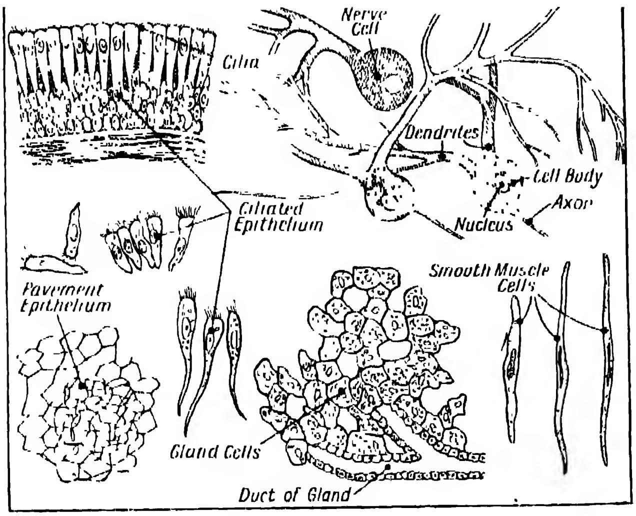
Classics. *Report of the Committee on Finance and Industry*, *Cmd.* 3897, 1931 H M.S.O.; *A Treatise on Money*, J M Keynes (Macmillan).

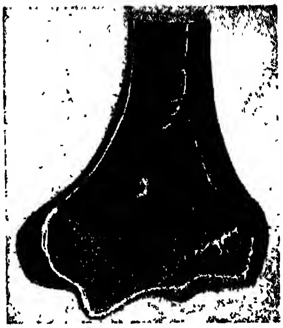
PHYSIOLOGY

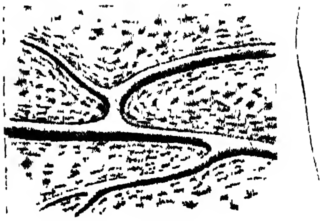
Human Physiology is a part of the subject of General Biology and this Course is therefore an extension of, and a supplement to, that on BIOLOGY *in Vol. 1. Similarly* ZOOLOGY *in Vol. 4, concerned with the anatomy, physiology, and ecology of the animal world, is a large-scale supplement to the main subject.*

In parts the same ground is necessarily covered in the three Courses, but each has its particular aspect. The student will therefore find that the basis and general principles of the subject are presented in BIOLOGY, *the make-up and working of the human organism in* PHYSIOLOGY *and of the non-human animal world in* ZOOLOGY. *With the Course on* BOTANY *in Vol. 3 the presentation of the study of the various forms of life on the earth is complete.*

13 LESSONS

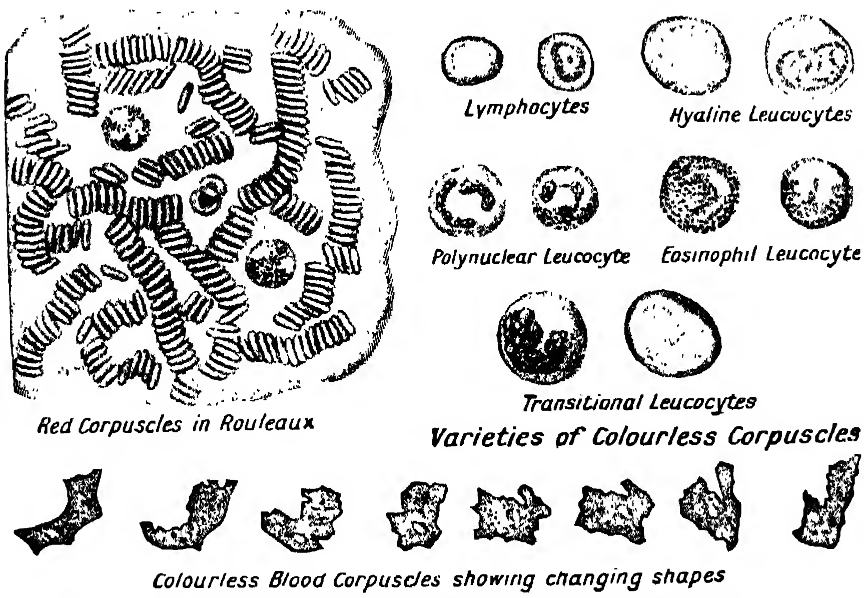






CELLS AND TISSUES

Above, various types of cell. Right : above, interior of the humerus, or arm bone, showing the open lattice-work tissue at its extremity ; below, section of the thigh bone, showing the canal-like spaces which carry the blood vessels that bring nourishment to the bone.



BLOOD CORPUSCLES. Top left, red blood corpuscles adhering together, as they sometimes do, in rouleaux like piles of coins. Top right, examples of the normal kinds of white cells in the blood. Of these the polynuclear leucocytes are by far the most numerous, and after them the lymphocytes. Lower, changes in shape observed in a white corpuscle moving on a microscope slide.

LESSON 1

Tissues of the Body

MAN is a living organism, an animal, a vertebrate, and a mammal ; therefore he has the properties of living organisms --animals, vertebrates, and so on, which are discussed in the Courses on BIOLOGY and ZOOLOGY. Conversely, many human characters will also be characters of other mammals ; some, of other vertebrates. The description of the functions of the human body which follows will therefore apply, in part, to other animals.

The substance of the body is made up of a great number of *cells*, and various products of those cells. Similar cells are aggregated into *tissues*, which in turn make up the *organs*. A consideration of the functions of the body may properly start with a brief survey of the more important tissues.

There are four main groups of tissues epithelial, connective, muscular, and nervous

Epithelium

Epithelium is a tissue covering a surface, or lining the cavity of a hollow organ. Its cells are scaliform, columnar, or cubical, and closely packed. The outer layer of the skin, the *epidermis*, is an epithelium of several layers of cells, the outer ones dying and constantly shed, being replaced by new cells formed by the actively-dividing cells of the innermost, or *basal*, layer. Epithelia lining the inner surfaces of the body are usually moist, kept so by the secretions of certain *mucous glands*, specialised cells in the epithelium. They produce the mucilaginous substance called *mucus*, or phlegm ; such an epithelium is called a *mucous membrane*. In the air passages to the lungs the epithelial cells are ciliated, and the beating of the cilia propels a current of mucus upwards towards the mouth. By this means they remove particles of dust inhaled in breathing. Apart from the mucous glands, which are single cells, epithelia may also form multicellular glands, lining pits which are tucked in from the general surface of the epithelium ; most of the digestive glands of the gut are of this type. Such an epithelium is physiologically active, producing its appropriate secretion. Other epithelia which are formed of notably active cells line the tubules of the kidneys, where they are concerned with the exchange of substances between the urine and the blood. By contrast, the epithelium of the skin is a tissue only protective.

Connective Tissues

The next group, the connective tissues, is a large one and includes diverse materials, among which are bone and cartilage. They are classed together because of their common origin in development. Areolar, or connective tissue proper, forms delicate sheets of transparent material binding organs and parts of organs together, and also forms sheaths for muscles, nerves, and blood vessels. Blood vessels and nerves run in it to their various destinations, and in some situations it becomes strong and fibrous to form tendons, connecting bones to muscles, and ligaments which unite bones.

Adipose tissue consists of cells filled with fat and held together by areolar tissue. It occurs in nearly every part of the body, and in fat persons grows in abnormal quantity in and around the muscles and under the skin. It forms a storehouse of fat which is available for combustion, to provide warmth and energy. Under the skin it prevents too rapid a loss of heat from the body. As a packing material it supports the internal organs and protects delicate structures from pressure.

Cartilage or gristle enters into the make-up of the framework of the body. In the foetus it represents temporarily the bony skeleton, which for the most part is laid down in it Where it persists it is found covering the ends of the long bones where they meet to form joints, joining the bony ribs to the breast bone and forming part of the nose Rings of cartilage support and strengthen the walls of the windpipe and the outer canal of the ear. Pads of it form buffers between the opposing surfaces of bones likely to meet with considerable shocks. Thus we find these pads of cartilage between the separate bones of the spinal column and in the knee joint. Cartilage consists of cells lying within a structureless matrix which they have secreted. Nutritive materials and oxygen must diffuse across the matrix to reach the cells, for cartilage does not contain blood vessels.

Bone consists of cells lying in a matrix which is impregnated with limy salts, mostly calcium phosphate. This inorganic material accounts for about two-thirds of the weight of a bone ; the other one-third is organic matter which forms gelatine on boiling The cells of bone remain alive, and in contact with one another, by fine processes. Since nutritive substances cannot diffuse across the dense matrix to the cells, bone is penetrated by blood vessels running in a system of small canals. The actual material of the bone is constantly changed throughout life, molecules being removed from the matrix and replaced by new ones ; only the form remains constant. (*See* illus. p. 954.)

Some parts of bone are very hard and solid ; in other parts it has an open structure. In the

centre of a long bone is a tubular cavity which contains the marrow, and this substance also fills the spaces in spongy bone. It is highly vascular, i.e. contains a large number of blood vessels, and in certain parts of it the red cells of the blood have their birth ; it is a blood factory.

Bones are covered with a tough fibrous membrane known as the *periosteum.* In it are the blood vessels which nourish the bone, branches passing from them into its substance.

In a growing child the bone grows in length by forming new bone in a detached piece of cartilage at the end of the bone known as the *epiphysis.* This cartilage is rich in bone-forming cells. Unless the food contains the lime and the growth vitamins necessary to enable these cells to do their work, the bone made is of poor quality, and the child may suffer from the disease of growth known as rickets. New bone is formed by cells under the periosteum, but the growth of a hollow bone also involves the removal of bone from the inner layers, to maintain the correct curvature.

Muscular Tissue

This is popularly called flesh. Its special property is being able to contract and so cause movement. There are two kinds of muscle voluntary muscle, which is under the control of the will, and involuntary muscle, which is not. The latter is under the control of a different part of the nervous system. Voluntary muscles are made up of fibres about 1/500 in. in diameter and about an inch long. These are collected into bundles supported and enclosed in areolar fibrous tissues. Bundles are bound together to form the muscles which clothe the bones, and the sheets of muscles which surround the trunk

Looked at under a microscope, the substance of a voluntary muscle fibre is seen to be made up of a number of tiny discs which give it a striated appearance. Each fibre is formed of a row of cells set end to end, the intervening cell walls having broken down ; it is therefore a *syncytium.* Nuclei are scattered along each fibre at intervals, lying near the surface of the fibre. Apart from the alternate light and dark discs, the fibre contains longitudinal *fibrils* embedded in the cytoplasm. When the fibres contract, they become shorter and thicker and the whole muscle does the same. A voluntary muscle in which each end is tied by a tendon to a different structure, it will alter their relative positions when it contracts. Thus one bone can be moved on another, as in making a movement of a limb.

The muscles of the internal hollow organs, the walls of which are able to contract, are of the involuntary kind The fibres are much shorter—formed of single elongated cells and do not show the striated appearance noted in the voluntary kind. Muscle of this kind is found in the walls of the digestive tube, the bladder, the air tubes, the walls of blood vessels, under the skin, and elsewhere. The muscle of the heart wall consists of short, branching fibres, which are striped ; it has a structure with some resemblances to both the voluntary and the involuntary type.

For nerve cells and fibres *see* Lesson 9.

LESSON 2

The Blood and its Functions

BLOOD may be regarded as a connective tissue with a liquid matrix. It circulates in the body in blood vessels, the arteries, and veins, being propelled by the action of the heart. As they reach the various organs, the arteries split up into smaller and smaller vessels, until eventually the blood is passing through extremely numerous and narrow vessels, the *capillaries* ; these vessels connect with one another and form veins, in which the blood returns to the heart.

The matrix of the blood is a yellowish fluid, the *plasma*, in which are suspended vast numbers of cells or blood corpuscles. The majority of these are disc-like with concave sides, 1/3,200 of an inch in diameter and 1/12,000 of an inch thick. They have no nucleus, tend to run together to form little rolls, and in mass give to the blood its red colour. The colour is due to the presence of a substance known as *haemoglobin.* In considerably smaller numbers, roughly one to every 500 or 600 of the red cells, there are colourless, irregular-shaped cells—the *leucocytes.* They are nucleated, can move independently of the blood stream, and are of various types. (*See* illus. p. 954)

The red blood corpuscles, or *erythrocytes*, are not able to pass out of the capillaries through their walls, but are always confined to blood vessels. The walls of the capillaries are very thin, consisting of a single layer of epithelial cells, and the *plasma* can diffuse through them. The *leucocytes* are also able to pass the capillary walls, by insinuating themselves between the epithelial cells ; the white blood corpuscles move as an amoeba moves, by putting out pseudopodia, though while in the blood stream they are more or less spherical.

It is not, then, whole blood which comes into contact with the actual tissues, but only the

plasma and a certain proportion of the white corpuscles. The plasma carries, in solution, nutritive substances and oxygen from the blood to the tissues, while waste products such as carbon dioxide pass into solution in the plasma and diffuse back across the capillary walls into the blood. The plasma, or *lymph*, can be carried away from the tissues, not in the blood but in a separate circulatory system, the *lymphatic system.*

The lymph collects from the spaces around the cells and passes into a system of conduits called the lymphatics, which permeate every tissue through and through. They commence as capillary vessels, which, joining up into larger and larger conduits, finally end in two large vessels, which pass up the front of the spinal column and empty themselves into the general blood stream close to the heart

Lymph is a clear fluid, but it contains vast numbers of cells known as *lymphocytes*, a special type of white blood corpuscle. All lymphatic vessels, at some point in their course, pass through structures known as lymphatic glands. These glands are round or oval bodies varying in size from a hemp-seed to a bean. They are composed of lymphoid tissue consisting of masses of cells, surrounded and supported by connective tissue. These glands manufacture the lymphocytes, which pass into the lymph in its passage through the gland.

The stream of lymph is kept circulating by means of the pressure brought to bear on the lymphatic vessels as they pass through muscles The contraction of the muscles tends to squeeze the contained lymph along the tubes, and the flow is aided by valves in the interior of the larger lymphatics which prevent movement of the lymph in an opposite direction. The lymph is discharged into the general blood stream.

In adults the blood cells are formed mostly in the bone marrow, the red cells from the walls of blood vessels, the white cells at other sites. The red cells lose their nuclei before they are released into the blood stream and have a life of about 70 days before they are broken up, in the liver, and replaced by new cells. During foetal life there are other sites of red cell formation, the liver and the spleen. The spleen is a store of blood in the adult.

Blood Clots

A striking physical property of blood is that of coagulation when it is shed, to form the well-known blood clot. It sets into a firm jelly, which soon contracts and squeezes out a straw-coloured fluid, the *serum*. The jelly consists of blood corpuscles enmeshed in a fine network of threads formed by a substance called *fibrin*, which forms only when blood clots. Serum is therefore plasma deprived of the protein substance fibrin. When a blood vessel is opened by injury, the clot seals the open end of the vessel. Therefore in dealing with a wound the clot should not be disturbed unless other measures are to be taken to close the vessel.

The clotting of blood is a complex process depending on the interaction of several factors. Besides the cells in blood, there are present also smaller bodies, the *platelets*, which are pieces broken off from certain cells of the bone marrow. If a blood vessel is injured, or blood is shed, the platelets disintegrate, liberating a substance, *thrombokinase*, which initiates the clotting process. The plasma normally contains certain proteinaceous substances, *fibrinogen* and *prothrombin*. Thrombokinase converts prothrombin, an inactive substance, into the active *thrombin*, the conversion being greatly accelerated by the presence of calcium in solution in the blood. Thrombin reacts with fibrinogen to form the insoluble protein, fibrin, which is found in the clot.

In some persons there is a hereditary failure of the blood to clot. Such people may die from loss of blood from a very slight wound and are known as bleeders, or *haemophiliacs* ; they have blood platelets which disintegrate only very slowly. Blood does not clot within a healthy blood vessel, because there is a substance in the blood which prevents it from doing so.

Blood as a Transport System

The white corpuscles of the blood are concerned in the defensive mechanisms of the body which will be considered later Apart from this, the blood is a transport system, carrying various substances about the body The blood plasma carries carbon dioxide and other excretory substances, food substances and *hormones* (chemicals concerned in the co-ordination of the body).

The erythrocytes carry oxygen bound to the respiratory pigment, haemoglobin, which is contained within them. A respiratory pigment is a substance able to form a loose bond with oxygen, to combine with it readily where there is plenty of oxygen available, and to release it equally readily where there is little oxygen present. Haemoglobin is a compound of a protein and another substance containing iron. The haemoglobin becomes oxygenated in the lungs, oxygen diffusing from the air in the lungs to the blood plasma and hence to the red cells. In the tissues, which are actively *respiring* (*see* Course on BIOLOGY), there is a continual need of oxygen, which is here given up by the haemoglobin and diffused through the plasma to the cells which are using it

Haemoglobin can also take up other gases, and in the case of the gas carbon monoxide, which is present in coal gas and the exhaust

fumes of a petrol engine, its affinity for this poisonous gas is greater than its affinity for oxygen; hence the dangerous nature of this form of gas poisoning.

The blood plasma contains, besides the proteins mentioned in connexion with clotting, food substances such as glucose, fat or fat-derivatives, and amino-acids, and also certain salts. The salts are chiefly the bicarbonate salts of sodium and potassium, and act as *buffers*, preventing the blood from being much altered by the addition of extra acid or alkalis. The blood-reaction is therefore fairly constant, slightly alkaline, and is kept constant not only by the buffering but by mechanisms connected with the kidneys and with breathing. Carbon dioxide is produced by the tissues which are respiring, and is carried away in the blood, partly in solution as carbonic acid, partly in combination as the blood salts. Some may also be carried in the corpuscles, but the main function of the erythrocytes is to carry oxygen.

LESSON 3

The Heart, and Blood Circulation

It is now over 300 years since the English physician William Harvey (1578–1657) recognized the real purpose and meaning of the heart. By patient and long observation he realized that blood entered the heart by the great veins and was expelled from it by the great artery, the *aorta*. He saw the pocket-like valves in the veins, which he perceived allowed the blood in them to flow only towards the heart, and he saw also that the valves in the interior of the heart kept the stream of blood through the organ flowing in one direction.

He tied a small vein and noted that the blood accumulated on the far side of the ligature away from the heart. When he obstructed the great veins entering the heart, he found that the chambers of the heart remained empty. Obviously, therefore, the veins brought blood to the heart, and the arteries carried it away from the heart. He disproved the prevalent idea that there was a communication between the two main chambers of the heart, but he was still unable to explain how the blood stream in the arteries found its way into the veins and so back to the heart. He believed that there were pores, or openings, somewhere in the distant parts of the body, where the arteries and veins communicated.

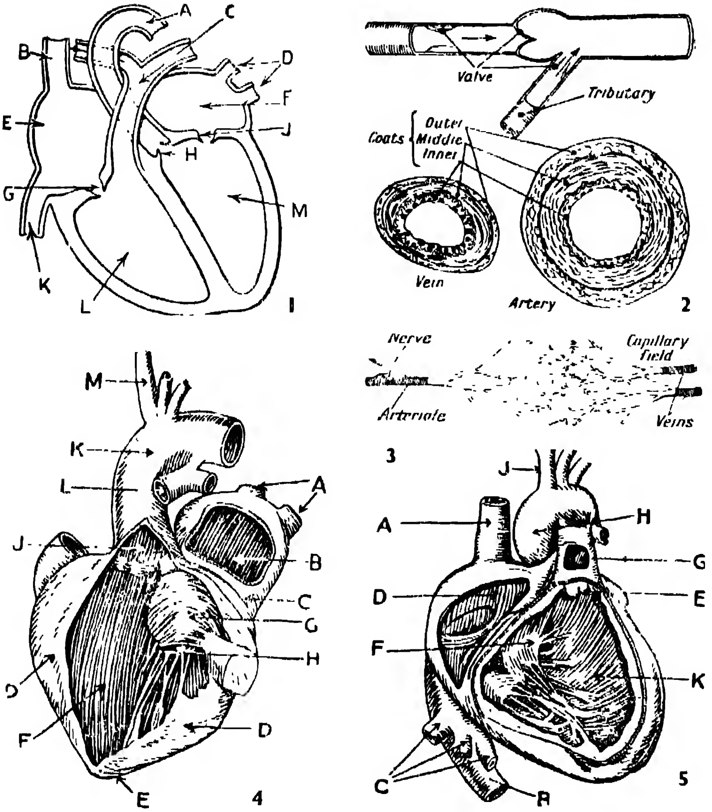
Four years after Harvey's death in 1657, Marcello Malpighi, an Italian anatomist (1628–94), discovered the capillary network of vessels which we have already seen to be the terminal ramifications of the arterial branches and the beginnings of the venous system. These, Malpighi found, were the pores that Harvey had been seeking.

Heart Structure

The heart is about the size of the closed fist of the person to whom it belongs. It weighs, when fully developed, about nine ounces, nearly four ounces of which are composed of that part of the organ, the left ventricle, which gives the propelling stroke to the blood destined to reach the farthermost parts of the body. The heart is cone-shaped and lies in the cavity of the *thorax* or chest, between the lungs, with its base uppermost and directed slightly to the right. The organ is enclosed in a thin-walled sac, the walls of which fold in on themselves at the base of the heart to cover its surface. The space between the two layers of this membranous sac is lined with epithelium and contains a small amount of fluid. This structure is called the *pericardium*, or pericardial sac. Its purpose is to permit the movements of the heart to take place with the absolute minimum amount of friction.

The walls of the heart consist of muscular tissue (cardiac muscle) differing in its structure from both voluntary and involuntary muscle. Some of the fibres run in a circular direction round the wall; others, more numerous, spirally or longitudinally. When the walls of the heart contract as a whole, they move inwards symmetrically, so that every part of the enclosed cavity is diminished in size to the same extent. If one tries to squeeze a rubber ball with the hand so as to expel its contents, it will be found very difficult to exert a uniform pressure, but the arrangement of the muscle fibres of the heart wall overcomes this difficulty in a very efficient manner, so that the whole contents of the chamber are expelled at each stroke of the pump. The walls vary in thickness, the upper parts being much thinner than the lower, the main pumping chambers.

The heart is divided into two main chambers, on the right and left. As it lies in the chest the right chamber is more to the front, although it is the tip of the left part which is in contact with the chest wall. Each chamber is again divided into an upper, thin-walled chamber, the *auricle*, and a lower, thicker-walled chamber, the *ventricle*. There are therefore a right and left auricle and a right and left ventricle. Each auricle and ventricle has between them a wide-mouthed opening guarded by a valve, which allows a flow of blood from auricle to ventricle, but not in the opposite direction.



THE HUMAN HEART. Fig. 1. Diagram of the organ in section : A, aorta ; B, superior vena cava ; C, pulmonary artery ; D, pulmonary veins ; E, right auricle ; F, left auricle; G, H, and J, valves ; K, inferior vena cava ; L, right ventricle ; M, left ventricle; Fig. 2. Cross sections of a vein and artery ; above, mechanism of vein valves. Fig. 3. Diagram of a terminal artery, capillaries, and veins. Fig. 4. Left side of heart : A, pulmonary veins ; B, left auricle ; C, wall of auricle ; D, wall of ventricle ; E, apex of heart ; F, left ventricle ; G, mitral valve ; H, opening of valve; J, semilunar valves of aorta ; K, aorta ; L. pulmonary artery ; M, arteries to head and arm. Fig. 5. Right side of heart : A, superior vena cava ; B, inferior vena cava ; C, hepatic veins ; D, right auricle ; E, valves of pulmonary artery ; F, tricuspid valve ; G, pulmonary artery ; H, aorta ; J, vessels from aorta ; K, right ventricle.

Valves and Their Functions

These auriculo-ventricular valves consist on the right side of two, on the left side of three, triangular-shaped flaps, or sheets, of a tough material attached at their base to the opening, the pointed end being attached by a number of cords to finger-like muscular projections from the ventricular wall. This arrangement permits of the tightening of the flaps and prevents them from floating up into the auricle. When the ventricle contracts, the edges of the flaps are forced together and close the opening, but the valve offers no obstruction to the downward flow of the blood from the contracting auricle. In the upper part of each ventricle, alongside the auriculo-ventricular opening but quite separated from it, is another opening. In the right ventricle this is the opening of the pulmonary artery, which takes the blood to the lungs ; in the left ventricle it is the aorta, through which is pumped all the blood to the rest of the body.

These openings are also each of them guarded by valves, which consist of three pocket-like folds of a tough membrane, with the mouth of the pocket directed upwards. When the ventricle contracts, they are forced back against the wall, but as soon as the consignment of blood has passed them, the pressure in the blood vessel fills the pockets and their margins come together, so preventing the blood from returning to the ventricle. They are known as the pulmonary and aortic valves.

The auricles are much less muscular than the ventricles. They are the receiving chambers of the pump and serve to keep the ventricles supplied with their full quota of blood. Into the right auricle open the two great caval veins, the *venae cavae* - upper and lower —delivering the blood from the parts above and below the heart. Into the left auricle enter four large veins—the pulmonary veins—which bring the blood back from the lungs, two coming from each lung. This blood, since it has just passed through the lungs and been exposed to the air in the lungs, is oxygenated, i.e. it is arterial blood. It is only in these veins that there is an exception to the general rule that veins contain venous or deoxygenated blood. Similarly, the pulmonary artery taking blood to the lungs is the only instance of an artery carrying deoxygenated blood.

The heart is able to contract in regular beats by virtue of an inherent power of contractility possessed by the muscular fibres themselves,

though this is materially assisted by nerve centres embedded in its walls. There is also a special structure situated at the junction of the auricles and ventricles which controls the rhythm of the rate of contraction of the auricles and ventricles.

How the Blood Circulates

Having thus considered the make-up of the heart, we are now in a position to follow the course of a red blood cell in its journey around the body, propelled by the pumping action of the heart. Let us follow it as it leaves a lung by a pulmonary vein and enters the left auricle charged with oxygen. The auricle contracts and expels it into the left ventricle ; the ventricle then contracts, the auriculo-ventricular valve closes, and the corpuscle is driven into the aorta. As the walls of the ventricle relax, the aortic valves close behind, and a route is open to any part of the body muscle, bone, brain, or internal organ as chance directs the corpuscle into one or other of the main branches which soon diverge from the aorta.

Soon or late it finds itself in a capillary vessel, a channel so small that the corpuscles have to pass in single file along it Here it gives up its oxygen to the plasma and so to the tissues. Passing into a capillary vein, it travels along veins of ever-increasing size until it enters the heart again by one of the great caval veins, so arriving in the right auricle. Thence it enters the right ventricle, which propels it through the pulmonary artery to the lung, to receive new oxygen. Its circuit has been completed.

The action of the heart pump is an intermittent one. At each contraction about an ounce and a half of blood is thrown into the aorta, and so into the general arterial circulation, causing a sudden distension of the vessels, which we perceive, when a finger is placed on the artery in the wrist, as the pulse. There is, however, a constant steady flow of blood through the vast network of capillary vessels, which permeates every fragment of every tissue throughout the body. Moreover, the demands for blood by the tissues of a particular part of the body vary from moment to moment according to their activities.

Thus, if a great muscular effort has to be made, involving the work of many muscles and demanding a generous supply of fuel, it will call for seven or eight times the amount of blood required by these muscles when they are at rest. When the whole body is at rest, the left ventricle throws about five pints of blood into the aorta every minute. Walking at four miles an hour entails a blood output four times as great, and in running upstairs the muscles may call for an output of 35 pints a minute.

But even when at rest there must be a steady flow throughout the vast capillary field. The walls of the aorta are elastic and distensible When it receives its load from the ventricle its walls expand and then recoil. The recoil is slow enough to give the mass of blood a steady push onwards. The combined contraction of the ventricle and aorta creates a head of pressure which would be sufficient to raise the column of blood five feet above the level of the heart

Control of the Heart-beat

The rate of the heart-beat is controlled through two sets of nerves, the *parasympathetic* system, fibres of which reach the heart in the *vagus* nerve, and the *sympathetic* system (*see* Lessons 9 and 10) The former tends to slow the rate of beat, the latter to increase it. Its normal rate, about 72 beats to the minute, is regulated by the opposing action of these two sets of nerves. In states of fear and when great physical efforts have to be made, the action of the sympathetic system in speeding heart-beat is aided by the secretion of *adrenalin* into the blood (*see* Lesson 8) The link between emotional states of mind and the heart-beat explains why this organ has always been supposed to be the seat of the affections The response to the call for blood a response which may entail the heart in dealing with the whole of the blood in the body, viz nearly nine pints, four times in every minute—is largely brought about by the increased rate of contraction.

Though the rate of heart-beat is under nervous control, the initiation of the contractions is not, for in embryos the heart starts to beat before it receives any nerve supply.

The proper adjustment of the blood supply to a particular organ or system of organs is dependent on a special kind of stopcock arrangement in the smaller arteries, provided by bands of circular muscle fibres in the walls of the small terminal arteries. Under the influence of the nervous system and the endocrine system the fibres contract or relax, and thus allow less or more blood to pass through the arteries.

Since there are tens of thousands of these terminal vessels, each with its own control, it will be seen that the total effect of the stopcocks will greatly influence the whole circulation. When, for instance, the muscles need more blood, the stopcocks of the muscles in action will be turned full on, while those of other parts of the body such as the skin and gut will be turned partly off. Similarly, when the processes of digestion are calling for a free blood supply in order that the digestive glands may be supplied with oxygenated blood, the stopcocks in the muscles will be partly closed.

When one gets up suddenly after lying down, blood would, if it were not for this arrangement tend to flow down into the lower parts of the body, the brain would be depleted of blood and one would feel faint. Hence the method of

treating a faint, namely, to keep the head low and so by gravity help to restore the blood supply to the brain.

Venous Circulation

There is still the movement of the circulation in the venous system to consider. Having passed through the capillary field, the propulsive action of the heart and great arteries has been to some extent dissipated. The blood stream from the lower parts of the body has to be assisted towards the heart against the action of gravity. Although considerable pressure from behind still remains, the venous blood is assisted on its course by several new processes. The large veins are furnished with pocket-like valves which have their mouths directed towards the heart, and serve to prevent the blood from flowing backwards in the veins. Again, when muscles contract, they exert a squeezing action on the veins within their substance. Combined with the action of the valves, which close behind the column of blood, this helps to propel it onwards ; since the veins are continually branching, there is no obstruction caused by this squeeze of the muscles for the blood propelled forward will at once find a route.

Fainting from standing still for a long period is due to interference with the blood circulation, and can be prevented by small movements of the leg muscles which will maintain the venous flow to the heart.

The movements of respiration also aid the venous circulation by creating a powerful suction action on the great veins inside the chest box. The more powerful and more rapid the inspiratory movements, the greater will be this suction action.

LESSON 4

The Breathing Apparatus in Man

THE term *respiration* is popularly synonymous with *breathing*, but in scientific usage it has a wider scope, covering two separate processes. First, the actions of breathing by which air is brought to the lungs (the *respiratory surface*), so that the blood may take up oxygen, is spoken of as *external respiration*. This contrasts with *internal* or *tissue respiration*, a term covering the very complex processes by which oxygen, having been brought to the tissues by the blood, is utilised in individual cells to break down foodstuffs (such as *glucose*) with the release of energy, and the formation of carbon dioxide as a waste product ; the carbon dioxide is removed in the blood.

The processes of tissue respiration are essentially similar in all animals, and in plants, and are dealt with in the Course on BIOLOGY. The methods by which oxygen is brought to the blood, the external respiration, varies in different animals ; for instance, in fishes oxygen is dissolved in the water in which the fish lives, and a stream of clean water must be maintained over the gills, which are the respiratory surface in these animals. The following description of the mechanism of breathing in man can apply also to other mammals, though there are differences in the other terrestrial vertebrates.

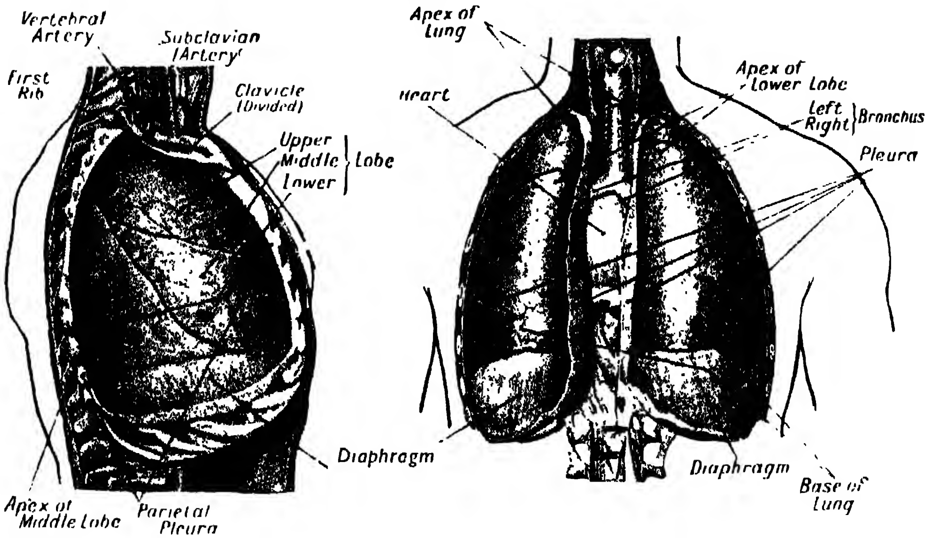
The *thorax*, or chest, in which the lungs are enclosed, can be compared with a bellows, the walls of which are the ribs and the flat sheets of muscle attached to them. The thorax is cone-shaped, open at the top to admit the *trachea*, or windpipe, and other structures ; while the wide base of the cone is closed below by a powerful sheet of muscle, the *diaphragm*, separating the thorax from the abdominal cavity. (*See* illus., p. 962).

The combined movements of the ribs and the diaphragm alter the size and shape of the thoracic box. As the ribs are lifted up and the diaphragm contracts, the cavity becomes enlarged in all its dimensions. The lungs are elastic and follow the movements of their enclosing walls, because, as the thoracic cavity enlarges, air enters the lungs by reason of the atmospheric pressure. The ribs then fall to their position of rest, the diaphragm relaxes, and the air is expelled. These movements, which take place at the rate of 17 to 20 a minute, are automatically controlled from a nerve centre at the base of the brain, but the activity of the centre may be influenced to a certain limited extent by emotional disturbance or voluntary effort.

The movements of the lungs are rendered easy and frictionless by their covering of a smooth, moist membrane, the *pleura*, which also lines the interior of the thoracic wall. There is a potential space between the pleura of the lung and that of the wall, but their surfaces are normally in contact and glide over one another as the lung expands and recedes. The lung is made up of a vast number of air chambers (together with air tubes leading to them), of blood vessels, and of a very extensive field of capillaries, closely associated with the air chambers.

Mechanism of Respiration

The human bellows has also a nozzle—the nose—and it is this, and not the mouth, which should be used as the entry for the inspired air. The cavities of the nose are chambers devised



LUNGS VIEWED FROM THE RIGHT AND THE BACK. Left, the right side of the chest has been removed, displaying the three lobes of the right lung, the diaphragm, and the pleura which lines the chest cavity. Right, both lungs are exhibited, also the heart, which lies between them, and the main air tubes. The lungs occupy most of the chest cavity and are protected by the ribs, while their apices extend above the collar-bone. Lung substance is soft and spongy, being largely filled with air.

for warming, filtering, and moistening the air as it passes over scroll-like bones within the cavity. These are covered with a highly vascular mucous membrane, the epithelium of which is ciliated. Dust and microbes are intercepted and dry air moistened hence the importance of nasal rather than mouth breathing.

Passing into the *pharynx*, or throat, the air enters the *larynx*, or voice-box, the opening to which is guarded by a valvular structure, the *epiglottis*. In the act of swallowing, this should close like a trapdoor and prevent food particles from going the wrong way, into the windpipe instead of the gullet. In the larynx the air passes between the vocal cords, curtain-like folds of tough membrane which by their vibration produce the voice.

From the larynx proceeds the main windpipe, the walls of which are strengthened by rings of cartilage. It passes down through the neck into the chest, where it divides into two main branches, the *bronchi*, one to each lung. As these pass into the lung substance they divide and subdivide into smaller branches, like the branches and twigs of a tree. The terminal bronchial tubes are of such smallness as only to admit the passage of a fine bristle, and are known as the *bronchioles*.

Structure of the Air Tubes

All the smaller air pipes—but not the bronchioles – are strengthened by cartilaginous rings Their epithelial lining is ciliated throughout the entire system, and secretes mucus to keep the surfaces moist. This arrangement serves to purify the inspired air from dust and microbes and prevent these from reaching the air chambers. The bronchioles have in their walls muscular tissue which exercises a stopcock action similar to that already described in the capillary system of blood vessels. This arrangement can ensure an equable distribution of air to the vast number of air chambers, and regulates the total air supply in response to the needs of the body. Undue contraction of these bronchioles under nervous influence constitutes an attack of spasmodic asthma.

If the larger bronchi should become invaded by microbes, as happens in a " bronchial cold," the ciliated epithelium becomes damaged by inflammation, the glands pour out an excess of mucus, and special expiratory efforts have to be made by the respiratory bellows to keep the passages clear ; hence the fits of coughing which are the familiar symptom of a bronchial infection.

Round the end of each terminal twig of the bronchial tree is set a bunch of minute air sacs each about $\frac{1}{10}$ inch in length and $\frac{1}{50}$ inch across. There are many millions of these air sacs, and each sac is made up of a number of smaller sacs lined with a thin membrane. The total area of this membrane throughout the lungs amounts to about 750 square feet ; through it gaseous interchange is made with the blood Altogether the air sacs can contain about four litres of air. Of this amount only about half a litre is breathed in and out at each breath, four-fifths of the air

being always retained during quiet breathing and at least one-third with the strongest expiratory effort. In the alveolar chambers the air comes into close contact with the blood circulating in the network of capillary blood vessels with which each air sac is closely invested. Oxygen passes into solution in the moisture lining the air sacs, and diffuses across the walls of the sacs and the walls of the capillaries into the blood plasma. The red cells, passing in single file through the capillaries, take up their charge of oxygen, and the plasma and cells give up their charge of carbon dioxide into the air sac. The red cells pass into capillary veins, and so through the great pulmonary veins to the left chambers of the heart, thence to be pumped all over the body

The rate of breathing is automatically controlled from a nerve centre in the brain, and is adjusted so as to prevent the level of carbonic acid in the blood from rising above a certain level There are sensory organs in the walls of the carotid arteries (those leading to the head) which are sensitive to changes in the acidity of the blood. if the blood reaction shifts in the direction of acidity, through the accumulation of dissolved carbon dioxide or other acids, these sense organs send messages to the respiratory centres in the brain, which in turn affect the muscles moving the chest wall and diaphragm, so that the rate of breathing is increased. The increased rate of breathing means that more carbon dioxide escapes from the blood into the lungs, its level in the blood being thus reduced ; the respiratory centres are no longer stimulated to increase the rate of respiration, which falls to a normal level. Conversely, a low level of carbon dioxide in the blood leads to a decrease in the respiration rate. Sudden or large changes in the acidity of the blood are prevented by the buffering action of the bicarbonates present. The respiratory centre can also be affected by a lack of oxygen, but in normal circumstances the carbon dioxide effect would be felt first.

At great heights—say, over 13,000 feet—the normal regulation processes of breathing become disordered. If the amount of oxygen in the air is reduced below 60 per cent, breathing becomes more rapid in order to obtain enough for the vital demands. This has the effect of washing out more than the normal amount of carbonic acid gas from the blood and thus depriving the blood of the substance which, acting on the nerve centre, should be the factor responsible for the quickened breathing. The normal action of the nerve centre is upset, the blood becomes insufficiently oxygenated, and mental and bodily weakness ensues.

LESSON 5

Digestion

Like all other animals, man has a continual need of food to supply the tissues with combustible material, the breakdown of which supplies energy for all the activities of life Food materials as taken into the body are not in a state in which they can be taken to the tissues ; they must first be broken down into substances simple enough to be absorbed through the gut wall into the blood, and subsequently stored in various ways until they are needed.

The breakdown of the food into substances which can be absorbed constitutes the process of *digestion* ; digestion is brought about by the action of various *enzymes*, or organic catalysts (*see* the Course on BIOLOGY), which are secreted into the gut by glands in its walls. The form of the gut and the nature of the enzymes present in an animal species will be correlated with the diet to which it is adapted ; man is an *omnivore*, taking both plant and animal foods, and has a digestive apparatus able to deal with either. During digestion, proteins are converted to a variety of *amino-acids* ; carbohydrates to simple sugars such as *glucose* ; and fats, at least partially, to fatty acids and glycerol.

Sampling and testing of the suitability of the food as to its composition and texture are carried out by the nose and mouth. The sense of smell will not only increase appetite but will give information as to the freshness of the food. Taken into the mouth, food comes into contact with the tongue, on the upper surface of which, as well as on the soft palate, are situated special nerve structures, the *taste-buds*

Sensations of sweetness, saltness, sourness, and bitterness are set up by the action of chemical substances in the food, giving rise to nerve impulses, which, being conveyed to the higher nerve centres in the brain, are recorded in consciousness Aromatic properties of the food, responsible for its flavour, act on special nerve endings in the deeper parts of the mucous membrane of the nose and palate. If these are out of action owing, say, to catarrhal inflammation, as in the common cold, the sense of taste is soon impaired. The texture of foodstuff is appreciated by other nerves in the tongue and mucous membrane of the mouth, so that the right consistency of food for digestion is ensured before it is swallowed.

In the mouth, food undergoes its first process of preparation, that of being broken up into small pieces, and rendered soft enough for easy

transport through the digestive canal by mixture with the saliva. The jaws and teeth form an efficient grinding and cutting machine. Powerful muscles attached to the upper and lower jaws cause the lower jaw to work on the upper in all directions, the lower jaw acting as a lever with its fulcrum at its articulation to the upper jaw.

During the lifetime two distinct sets of teeth are provided. By the end of the third year of life a child should have the first set of milk teeth, ten in either jaw These are gradually replaced by the adult set, and twelve additional molars, or grinding teeth, are added.

Salivary Glands

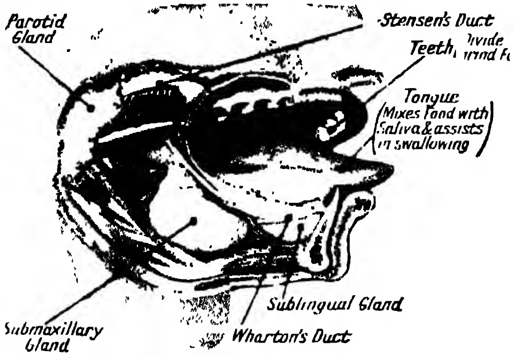
Further preparation of the food in the mouth is effected by salivation. Saliva is the juice poured out by the salivary glands, of which there are two pairs in the floor of the mouth and one pair, the parotid glands, situated in the cheek. The salivary glands consist essentially of a layer of cells arranged around a central cavity and forming tubular structures or groups of vesicles like bunches of grapes, the tubules or vesicles being held together by areolar tissue. From the central space, or lumen, the secretion passes into small ducts, which join up to form a main duct leading from the gland to the mouth.

Capillary blood vessels closely encircle the tubules or vesicles, the blood supplying oxygen, and the materials necessary to form the secretions, to the glandular cells.

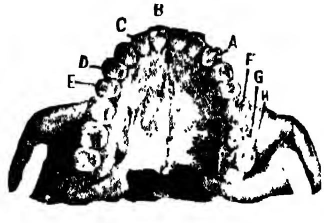
Saliva is a watery fluid of slightly alkaline nature, containing an enzyme called *ptyalin*. The action of this substance is to convert starch into sugar, so long as it can act in an alkaline medium. Saliva has also an important mechanical action in moistening and softening the food so that it is converted into a soft mass, capable of being readily swallowed. Secretion of saliva is brought about by the smell, sight, or expectation of food, but principally by the contact of solid substances with the taste-buds and touch centres on the tongue and mucous membrane of the mouth. Nerve influences passing from these outlying nerve endings to the central nervous system cause impulses to be sent to the glandular secreting cells.

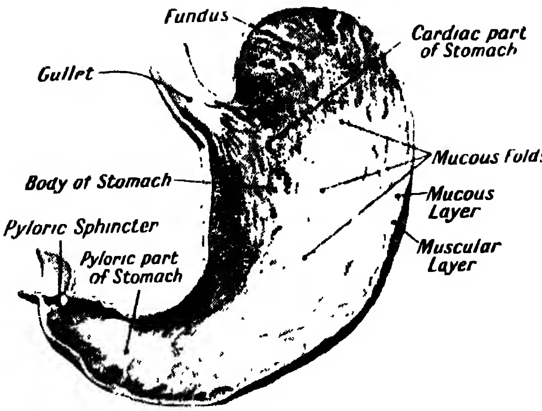
Act of Swallowing

The food enters on its journey through the internal digestive tract by being swallowed. The cavity of the mouth opens into the muscular pharynx, or throat. The pharynx opens into the gullet or *oesophagus*. The opening of the windpipe lies immediately in front of the opening of the gullet, so that the airway, proceeding from the back of the nasal cavity, has to cross here the line of traffic of the food. When swallowing occurs, the air current is interrupted--one cannot swallow and breathe simultaneously. In the act of swallowing, the soft palate acts as a valve which, closing upward, shuts off the airway above. Over the opening of the windpipe, and covering the entrance to the larynx, another flap-like valve, the epiglottis, shuts down and



Salivary Glands





FIRST STAGES IN DIGESTION. Having been moistened by saliva and broken up by mastication, food passes down the gullet into the stomach, the inner surface of which is shown on the right. Above, right, are seen the teeth of the upper jaw : A, canine , B, central incisor ; C, lateral incisor ; D and E, 1st and 2nd premolars ; F, G, H, 1st, 2nd and 3rd molars.

closes the airway below. The opening of the gullet is relaxed and the path is clear for the food to pass down this tube.

Swallowing is voluntarily initiated by causing the tongue to move and act as a kind of piston in propelling the food back into the pharynx. As soon as the portion of food touches the sensitive mucous membrane covering the pharyngeal wall, the muscular walls of the latter take charge, seize the mass, and squeeze it backwards and downwards. This is a good example of what is known as *reflex action*, i.e. one taking place without control of the will. The muscles of the oesophageal wall are smooth, or "involuntary," muscles.

The Gullet

The oesophagus, or gullet, is a tube 9 to 10 inches long. The muscular tissue in its wall is in two layers; in one layer the muscle fibres encircle the tube, in the other they run longitudinally. The inner surface of the tube is lined with a mucous membrane which secretes a lubricating material, facilitating the passage of the food. The circular and longitudinal muscle fibres of the tube wall contract and relax in successive segments as the portion of food is squeezed downward by a wave-like contraction set up by the contact of the mass with "tactile" nerve endings in the mucous lining.

Arrived at the bottom of the tube, the food mass is momentarily checked in its progress, as the entrance to the stomach is guarded by a ring of muscle, or sphincter, controlling the entry. This ring is normally in a state of constant contraction, and opens only when food comes into contact with it. It is known as the *cardiac sphincter*, owing to its proximity to the heart.

The Stomach

The stomach is a baglike organ, one border of the bag being four to five inches long (the shorter curvature); the other (the larger curvature) makes a wide curve, passing up under the dome of the diaphragm and sweeping down and across the middle line of the body; the stomach lies more in the vertical line of the body than the transverse.

As with the gullet, its wall is composed of a muscular and a mucous coat. The muscle fibres are arranged in three layers: those of the innermost layer encircle the bag, the outer ones run lengthwise, the middle ones obliquely. As a result of this arrangement, muscular contraction sets up wave-like movements which, beginning at the cardiac end, follow one another in quick succession along the length of the organ, churning up the contents and propelling them gradually towards the outlet. Nearer the outlet the circular muscle fibres become more pronounced, so that this end of the organ becomes of a more tubular shape as compared to the upper, more baglike, part. At the actual outlet the muscle forms another sphincter, the *pylorus*, guarding the flow from the stomach into the intestine. It relaxes when the food in the stomach is being passed into the next section of the digestive tract.

Gastric Glands

The mucous membrane of the stomach is thickly studded with tubular glands, which secrete the gastric digestive juices. They lie among a close network of capillary vessels derived from large blood vessels which run along both curvatures and come direct to the stomach from the aorta. The veins from the stomach pass to the liver. In the mucous membrane there is also a close network of lymphatics.

The stomach is richly supplied with nerves taking messages between the organ and the central and sympathetic nervous systems. Through their agency the movements of the stomach are initiated or inhibited in response to the presence or absence of food in its cavity. The nervous system also affects the secretion of gastric juice. Hence the dependence of stomachic digestion upon the general condition of the mind as well as the body.

Food, having entered the stomach, is churned up, mixed with the digestive juice and becomes liquefied. The time taken for complete discharge of a meal from the stomach varies with the character of the food, the activity of the digestive processes, and the nervous influences brought to bear during digestion; but normally the whole meal should be evacuated from the stomach in four hours or less. It passes into the *duodenum*, the first part of the small intestine.

The Gastric Juice

The active principle of the gastric juice is a ferment or enzyme called *pepsin*, combined with hydrochloric acid. The acid is secreted by special so-called *oxyntic* cells in the gastric glands, and constitutes about ½ per cent. of the total secretion. Over 98 per cent. of the juice is water; the remainder consists of pepsin, mucus, and the chlorides of sodium and potassium.

Secretion of the gastric juice begins only a few minutes after food is taken, under the influence of nervous stimulation reaching the stomach by the vagus nerve. The continued secretion of the juice depends on the presence of partially digested food in the stomach. The mechanism of the continued secretion may be hormonal, but it is not fully understood.

The main purpose of the gastric juice is to start the splitting up of the nitrogenous (protein) substances in food. The action of *pepsin*, acting in an acid medium, is to break the large protein

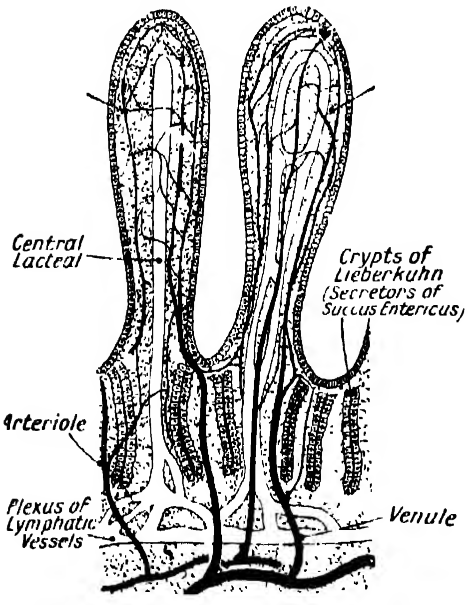
molecules into the smaller molecules of *peptones* and *proteoses*. Starch and sugar are not acted on by the gastric juice, but it has a slight digestive action on fats. The food mass is softened and liquefied to a thick creamy consistency. At intervals the contractions of the stomach pass the food through the relaxed *pylorus* into the *duodenum*.

Digestion in the stomach does not proceed far enough for most food materials to be absorbed, but water, alcohol, some kinds of sugar, and some mineral salts in the food can be absorbed directly from the stomach. The rapid entrance of alcohol into the blood is familiar.

The Small Intestine

This is a muscular walled tube about 1 inch wide and 20 feet long. It consists of three portions. The first, the *duodenum*, forms a loop some 10 inches in length. The rest of the small intestine consists of the *jejunum* and the *ileum*. The differentiation of the two latter segments is quite arbitrary ; it is impossible to say precisely where the jejunum ends and the ileum begins, the former merging imperceptibly into the latter.

The small intestine lies in folded coils, which occupy the greater part of the cavity of the abdomen. The coils are linked together and suspended by folds of a delicate membrane, the *peritoneum*. This membrane lines the inner surface of the abdominal wall, and is reflected thence on to the intestines, around which it is closely wrapped. The folds attached to and suspending the gut are known as the *mesentery*. In between the layers of the mesentery run the blood vessels, nerves, and lymphatics, supplying the gut.



VILLI OF THE SMALL INTESTINE. The tiny finger-like processes, or villi, which stud the lining of the small bowel have a little blind tube or loop in the centre (the central lacteal) up which emulsified fat passes to the thoracic duct.

The surface of the peritoneum is moist and glistening, so allowing the coils of the gut to move over each other with ease. The wall of the small gut consists of this outer peritoneal covering, two muscular layers—one of fibres encircling the wall, the other of longitudinal fibres—and an inner lining of mucous membrane. In the upper part of the gut this lining membrane is in crescentic folds, and throughout its extent it is studded thickly with small *villi*, or projecting finger-like processes, which give it a surface resembling the pile of velvet. This arrangement increases enormously the actual surface area of the inner wall of the gut.

There is an abundant supply of blood vessels and lymphatics to the wall of the gut, and these send capillary loops into the substance of each villus. Between the muscular layers is a network of nerve cells and nerves. Embedded in the mucous membrane and closely packed together are tubular glands closely surrounded with blood vessels. They secrete a digestive juice—*succus entericus*—and a mucus-like fluid which lubricates the inner surface.

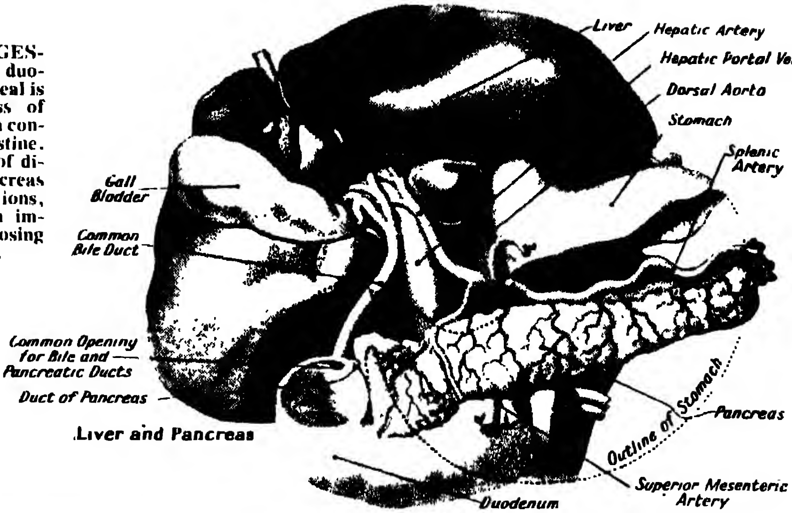
Two kinds of movement take place in the small gut to aid the digestive process and effect the transport of its contents. The muscles effect a squeezing and kneading of the contents without actually moving them along the gut, and wave-like contractions beginning in its upper part and following each other down the length of the tube move the contents along at intervals. These waves of contraction are called *peristalsis*. They are set up by the nerve-muscle structures in the wall of the gut.

Intestinal Digestion

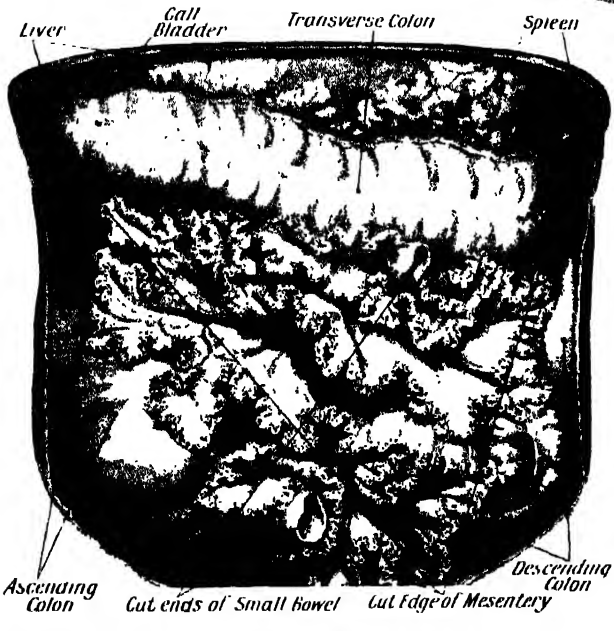
The transit of the food through the small gut takes place normally in about four hours, though it may be three or four hours longer before the last traces of a meal are passed into the large intestine into which the small intestine opens at its lower end. During this time the greater part of digestion takes place. This is effected by the intestinal juice and by two other juices which are poured into the first loop of the gut, the duodenum. Into this loop, which curves away from the stomach to encircle the end of the *pancreas* or sweetbread, a duct opens. One part of this duct conveys the secretion from the pancreas, the other part conveys bile from the liver.

The pancreas is a glandular structure consisting of groups of gland cells supported by areolar tissue ; it measures about 6 to 8 inches in length and about 1½ inches in breadth and thickness, and weighs about 3 ounces. It lies imme-

ORGANS OF DIGESTION. Food enters the duodenum shortly after a meal is begun and the process of digestion and absorption continues in the small intestine. The associated glands of digestion--liver and pancreas - provide special secretions, and the liver plays an important part in the disposing of food substances.



Liver and Pancreas



The illustration on the left shows the abdominal cavity with the layers of peritoneum (membrane lining the abdominal cavity), which anchor the small intestine to the body wall, divided ; these particular layers of peritoneum are called the mesenteries The cut margin shows the ends of arteries and veins which pass to and from the intestine. The last coil of the small intestine joins up with the colon, or large intestine, on the lower right side of the abdomen. The colon passes upwards, bends suddenly across the upper part of the abdomen, and passes down the left side.

diately behind the stomach. Most of its cells secrete a digestive fluid, the pancreatic juice ; but certain special cells in it manufacture a hormone or messenger substance commonly called *insulin.*

Secretion of pancreatic juice is activated by a hormone known as *secretin*, derived from glandular cells situated in the wall of the duodenum. The secretory activity of the pancreas is, like that of the stomach, also under nervous control. Bile is manufactured in the liver, and is collected by ducts in the liver substance into the gall bladder, from which it passes by the bile duct into the duodenum.

Bile is a greenish fluid, coloured by pigments produced during the breakdown of red blood corpuscles in the liver ; these pigments are excreted in this way, and have no digestive function. The bile also contains various salts, some of which are peculiar to the bile and are called the " bile salts."

Intestinal digestion is brought about by the combined action of the *succus entericus*, the pancreatic juice, and the bile. These secretions are alkaline and neutralise the acid contents of the stomach. Thus far, all the digestion that has occurred is the breakdown of some starch into sugar in the mouth, and the beginning of the breakdown of proteins (and a little fat) in the stomach.

Protein digestion is continued by the action of *trypsin*, which converts proteins, peptones, and proteoses to polypeptides and some amino-acids. *Trypsin* is derived from the pancreatic juice, but, lest it should digest the substance of the pancreas itself, it is secreted in an inactive form, *trypsinogen*, which becomes active only when it meets one of the enzymes of the *succus entericus*, *enterokinase*. The walls of the intestine are protected from the action of trypsin.

Other enzymes of the *succus entericus* convert the polypeptides left by the trypsin into amino-acids ; the digestion of proteins is then complete.

The remaining starch and the complex sugars in the food are attacked by enzymes from both the pancreatic juice and the *succus entericus*, and broken down to the simple sugars such as *glucose*. The fate of fat is rather more complicated ; the bile salts are important in that they *emulsify* the fats, causing them to form a suspension of very small droplets, and also greatly increase the rate of action of the *lipase* (or enzyme acting on fat) of the pancreatic juice. The *succus entericus* also contains a lipase. Fats are broken down to *glycerol* and *fatty acids* ; the contents of the intestine are not sufficiently alkaline to permit the formation of much *soap*.

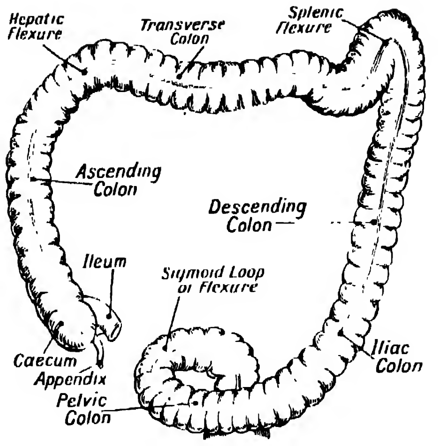
Practically all the nutritive materials are absorbed from the small intestine. Glucose passes into the capillaries of the villi and by way of the portal veins to the liver, where it is converted into the substance *glycogen*, and stored for future use. Proteins are absorbed as amino-acids, and pass as such direct into the blood stream and are carried to all the body cells.

The absorption of glucose and amino-acids is an active process carried out by the cells of the epithelium lining the gut, and takes place at a rate independent of their concentration in the intestinal fluid. The bile salts are also absorbed into the blood capillaries in the villi and returned to the liver, where they can be used again to form bile.

The fats absorbed pass not into the capillaries of the villi but into the lacteals and so to the lymphatic system, before reaching the blood. It is possible that the smallest droplets may pass the epithelium as fat, but most are transported across it as fatty acids and glycerol, and reconstituted as fat in the lacteals, where they give the lymph a milky appearance. It is thought that some of the glycerols may pass directly into the blood stream, but the fats do not do this.

The Large Intestine

The small gut enters the single loop of the large intestine or *colon* low down on the right side of the abdomen. The opening is guarded by the ileo-caecal sphincter, which prevents return of the contents of the colon into the small gut. Below the opening the colon has a blind end or sac called the *caecum*, which ends in the *appendix*, a vestigial organ in man but important in herbivorous animals. The vermiform appendix is the remains of what was once a large caecum in our very remote ancestors, the caecum having in aeons of time become greatly reduced in size, in conformity with the digestive needs of human beings. The human appendix varies in length from about two inches to six inches. It is very liable to attacks of inflammation, this



EXTENT OF THE COLON. Successive portions of the large intestine are named the ascending, transverse, descending, iliac, and pelvic colons.

giving rise to a condition called appendicitis. The inflammation is caused by infection from bowel organisms, rarely through invasion by foreign bodies. This trouble starts with abdominal pain, accompanied by a feeling of sickness. The pain is sometimes short and mild, or it may be a serious condition. In acute appendicitis, sudden onset and violent pain may cause collapse and need immediate operation for removal of the appendix.

The colon passes up in the right flank, crosses the abdomen at the level of the navel, and descends in the left flank to the pelvis, where, after forming an open loop—the sigmoid flexure—it becomes the rectum and opens to the surface at the anus.

The colon is about 70 inches in length and, cut open, measures 6 inches across. The wall has a mucous lining in which are glands secreting mucus for purposes of lubrication. In the colon, water is resorbed from the undigested food remains.

The wall of the colon is puckered into pouches and folds, an arrangement permitting a retention of its contents until they are passed on to the rectum for evacuation. This movement normally occurs after taking a meal. The presence of the faecal mass in the rectum gives rise to the desire for evacuation, and if a suitable voluntary response is made to the stimulus, the wall of the rectum contracts and the powerful sphincter muscle which guards the anus relaxes.

The digestive functions of the large intestine in man are negligible, but in certain herbivorous animals they may be important. There is a large bacterial population in the human large intestine, the bodies of which make up a large part of the bulk of the faeces. The content of the faeces otherwise depends on how much indigestible fibrous matter is taken in the diet

LESSON 6

Nutritional Value of Food Substances

Foods are classed under three headings proteins, carbohydrates, and fats.

Proteins consist of highly complex combinations of carbon, hydrogen, oxygen, nitrogen, and sulphur. Of these the nitrogen is the essential and characteristic constituent Proteins enter largely into the make-up of the protoplasm of the cell, and hence are essentially the building materials of the body. Proteins are, as already noted, broken down by digestion into amino-acids. These are nitrogenous substances of various kinds and of varying values as building material that is to say, some proteins contain better types of building material than do others. Those amino-acids which are required by the tissues for building purposes are extracted by the cells of the body and built up again into proteins The remainder are eventually taken in by certain cells of the liver, where they are broken down further, or *de-aminated* The nitrogenous parts form *ammonia*, which is converted to *urea* and eventually disposed of by the kidneys. The non-nitrogenous part can then be burnt in the tissues, during respiration, to provide energy Proteins of various kinds are found in all animal products and in most vegetable foods. Those of animal origin are of the highest value in human nutrition.

Carbohydrates consist of carbon, hydrogen, and oxygen, the last two elements being combined in the same proportions as in water, viz 2 atoms of hydrogen and 1 of oxygen The carbohydrate foods are sugars and starch, the latter being converted into sugar in the process of digestion. The principal product of the digestion of all carbohydrate foods is the sugar glucose. It is stored in the liver as glycogen, only a certain amount being released into the blood. The level of glucose in the blood is under hormonal control, and will be described later.

Carbohydrate furnishes about two-thirds of bodily energy. Some tissues, notably the brain, are exacting in their fuel requirements and will utilise only glucose Excess of carbohydrate is converted into, and stored as, fat. The common sources from which it is derived are the cereals, root vegetables, tubers such as the potato, the various forms of sugar—cane, beet —milk, fruit, etc. These foods, especially the cereals, are the most economical sources of energy, because they are less costly than foods of animal origin.

Fat foods consist of complex combinations of carbon, hydrogen, and oxygen. They do not, however, burn as readily in the body as do carbohydrates, and, indeed, are dependent on the presence of an adequate amount of sugar in the blood for their complete combustion. They, as it were, burn in the fire of carbohydrates, but, weight for weight, yield more energy than either carbohydrates or proteins. Certain products of the breakdown of fats may be very important as structural elements in the body, and as the precursors of certain hormones.

The basal requirements of the body for fuel substance, i.e. when the body is at rest, can be accurately estimated by measuring the amounts of oxygen consumed, and carbon dioxide given out, by the lungs. It is merely a matter of mathematical calculation. When muscular work is undertaken, the additional amount required to supply the additional energy can be as readily ascertained. The chemical make-up of foodstuffs being known, and it also being known how much energy in the form of heat a given quantity of protein, carbohydrate, or fat, will give out when burnt, the fuel value of a particular food can be accurately estimated.

The amount of energy expenditure involved in performing muscular actions of various kinds has also been carefully estimated. It remains only to adapt the quantity of fuel to the energy to be expended and to see that all three classes of food are made use of. A given weight of fat will provide more than twice the amount of energy, if fully burnt, as the same weight of carbohydrate or protein.

So far as actual foodstuffs are concerned, some contain much more water than others and are correspondingly less valuable as fuel, weight for weight, than those that contain little or no water. Sugar and fat are free of water, but vegetables and fruits may consist of up to 93 per cent. of water and are therefore poor fuel. From these facts the caloric requirements of various individuals with varying activities can be estimated. Thus, of two men whose basal requirements are, say, 1,400 calories, one who is doing sedentary work most of the day may need only an additional 1,000 to 1,500 calories, while the other, doing heavy manual labour, may need a further 3,000 to 4,000. Children require more fuel in proportion to their size than adults owing to their brisk metabolism and unceasing activity. Under ordinary conditions and in health, appetite is a sufficient guide by which to adjust fuel food requirements to energy expenditure with sufficient accuracy. Excess of fuel in relation to energy expenditure leads to undue increase in weight, and vice versa.

Protein requirements for growth and repair involve several factors. The quality of the protein has to be considered, and there is an

amount that is the minimum compatible with life, as well as a larger amount calculated to promote the maximum vigour and resistance to disease. As to quality, it has already been noted that the nutritive value of proteins is variable, depending on the number and kind of amino-acids contained in them. Certain of these amino-acids are necessary, for example, in the manufacture by the body of the hormones, of other glandular secretions, and of certain tissue cells. A diet deficient in them cannot produce perfect health.

The best-quality proteins, in their completeness for human nutrition, are those of milk, meat, and eggs. Of lower value are those of plants. The proteins supplied by the cereal grains and by the pulses, such as peas and beans, while of great value in nutrition, cannot be depended on as the sole source when used alone—although, used in combination, they supplement to some extent each other's deficiencies in one or another amino-acid.

In practice the daily need for protein can be well met by consuming daily half a pint of milk, one egg, two ounces of cheese, and four to five ounces of meat or fish. These will supply the best-quality protein, and the cereal foods—bread, rice, flour, etc.—and the vegetable foods—potatoes, greens, pulses, etc.—taken to supply energy, may be depended on for the rest. Growth in children demands a more generous supply of animal protein than do the repair requirements of adults. Increased physical work calls for a higher consumption of carbohydrates and fats, but not of protein as such.

Mineral Salts

The important rôle played by mineral substances in the food has long been recognized. They are concerned with growth and repair, with the proper functioning of every organ and system in the body and enter into the make-up of all the tissues, fluids, and secretions. Most minerals are needed only in small amounts, but as they are constantly lost in the urine they must be replaced from the food. When a food substance is burnt, an ash remains which is composed of the salts of a variety of mineral elements. A salt is the combination of a chemical element with an acid.

The elements of most importance in the body, and therefore essential in the diet, are sodium, potassium, magnesium, phosphorus, calcium, iron, iodine, and chloride. Traces of other elements are also needed, for instance, copper and zinc. Most of these will be supplied in adequate quantities in a normal diet. Sodium chloride is present in the largest amount in the body fluids, but is not likely to become deficient except when there has been excessive sweating; if this happens, muscular cramps may result, but can be prevented by drinking, not pure water, but water with a little salt added, or some other drink which contains salt.

Calcium is much more likely to be deficient in the diet; not all the calcium in the food is absorbed in the intestine, so that some is lost. Calcium is of great importance in many of the physiological processes of the body, for instance in the action of the muscles, the clotting of blood, and obviously in the formation of the limy tissues, bone and teeth. Pregnant and lactating women have particularly high calcium requirements, for they must provide for the baby as well. Milk and cheese are good sources of calcium. Iron, being a constituent of haemoglobin and some other similar substances important in metabolism, is also needed; a deficiency leads to anaemia. An adequate supply of iron is particularly important to pregnant and lactating women and to adolescent children; soup prepared from marrow bones or liver is a good source.

Goitre, or "Derbyshire Neck"

Iodine is needed because it is a constituent of the secretion of the thyroid gland, which controls the rate of metabolism of the body, but the daily requirement is small. Deficiency is often a regional phenomenon, and is shown by the development of simple goitre or "Derbyshire neck"; this is most common in places remote from the sea.

Though minerals are present in most natural foodstuffs, the methods of preparing the foods for marketing and consumption are often responsible for depriving the foods of their mineral value. The prolonged boiling of vegetables in much water dissolves out the mineral substances, and unless the water is used, these are wasted. The milling of cereals, as in making white flour, removes the part of the grain that is rich in salts.

The Vitamins

Perhaps the most important discovery in the chemistry of vital processes is that of the "accessory food factors" essential for the maintenance not only of health but of life itself. These substances, called vitamins, some of which have been synthesised, are essential constituents in small, sometimes infinitesimal, amounts of any diet. Following the postulation of their existence in 1912, they were isolated and named by letters of the alphabet; but continued research into their chemical composition and their synthesis in the laboratory have demonstrated the composite character of many of the original substances.

Vitamin A is fat-soluble and is found in animal fats, being present in fish liver oils (especially halibut and cod), milk, cream, butter, cheese, and egg yolk. *Carotene* is the precursor, or proto-vitamin A; it is present in carrots, green

vegetables, milk, kidney, and liver; it is gradually converted by the liver into vitamin A. Vitamin A_2 is a closely related substance found in the liver oils of fresh-water fish. The A vitamins are fairly readily oxidised when heated in air, as, for example, when milk is boiled in an open pan; but are not destroyed by the pasteurising process, in which the milk is kept at a fairly high temperature in a closed vessel. Deficiency of this vitamin leads to night blindness or loss of visual acuity in dim light, and to widespread damage to mucous membranes, including those of the eyes.

Vitamin B, a water-soluble compound, consists of several factors, the more important of which are dealt with here.

Vitamin B_1 (Thiamine) is present in the pericarp and germs of cereals, in yeast, egg yolk, liver, legumes, and pork. It is present in high concentration in rice polishings and is destroyed by heat. Its absence leads to the disease beri-beri, characterised by neuritis and heart failure, prevalent particularly among Eastern Asiatics who live mainly on fish and polished rice.

Vitamin B_2 (*Riboflavin*) is a growth-promoting factor; its absence leads to dermatitis and disease of the eyes and may also play a part in pernicious anaemia and sprue. Its chief sources are yeast, leafy vegetables, milk, egg, fish roe, and liver. It is not destroyed by heat.

Vitamin B_6 (or *Pyridoxine*) is present in yeast, liver, fish, eggs, and wheat germ. It is a growth-promoting factor in the rat and its absence also causes dermatitis, anaemia, and brain cell degeneration. The P.P. or pellagra-preventive factors are *Nicotinic acid* and *Nicotinamide*, widely distributed in liver, yeast, eggs, meat, milk, cheese, and cereals, in association with other B complex vitamins. Their absence is partly responsible for pellagra, a disease occurring among peoples on diets of low food value, characterised by dermatitis and inflammation of the tongue.

Vitamin C is hexuronic acid, but owing to the fact that its absence from the diet leads to scurvy it is usually known as *ascorbic acid*. It is present in fresh fruits, especially black currants, oranges, lemons, and tomatoes, rose hips, paprika, and green vegetables, especially spinach. Vitamin C is water-soluble, and as it is destroyed by heat in air it is frequently lost from vegetables by cooking.

Vitamin D is associated with vitamin A in animal fats, especially in cod-liver and halibut-liver oils; its absence from the diet leads to softening of the bones and infantile rickets. Vitamin D can also be produced artificially by the action of ultra-violet light (a mercury vapour lamp, or sunlight) on various complex substances such as ergosterol, which is present in the skin in small quantities.

Vitamin E is a yellow oil insoluble in water, found in lettuce, wheat germ oil, peanuts, egg yolk, butter, and embryos of seeds. It is needed for reproduction and is known as the anti-sterility vitamin.

Vitamin K, a term which now covers an extensive group of compounds, is the anti-haemorrhagic factor; its lack leads to poor clotting power of the blood. It is present in green plants, bacteria, and fish meal.

Vitamin P (*Citrin*) is found in lemon juice and rose hips; in its absence the blood capillaries become fragile and haemorrhage occurs. This factor will restore capillary resistance in scurvy.

Water and Roughage

Two other factors of fundamental importance in nutrition remain for consideration. First, an adequate supply of water is essential. It forms the medium in which all the chemical processes of the body are carried on. Water is being continually lost from the body in the breath, from the kidneys and bowels, and from the skin. Evaporation from the lungs and skin is of importance for regulating the heat of the body. This loss must be constantly made good. Though most foods supply their quota of water, at least 3 pints of additional fluid are required daily. Normally the human body consists of about 60 per cent. of water. When vegetables and fruit enter freely into the diet, the intake of water can be considerable: boiled cabbage consists of about 90 per cent. of water, a ripe strawberry more than 80 per cent., a raw apple 82 per cent.

The second remaining important factor is roughage. This is the term applied to the indigestible residue of food; it chiefly consists of the woody fibre or cellulose of plants and fruits. It gives bulk to the contents of the colon. Deficiency of this material leads to constipation.

Satisfactory nutrition, by which is meant a constant supply of all the material required by the body cells, can be secured only by ensuring a correct balance in the daily dietary. Not only must the need for fuel be met—and for this, appetite is usually a sufficient guide—but an adequate amount of good protein must be taken, and a full supply of each of the vitamins and minerals be ensured. For this purpose dairy produce, vegetables, and raw fruits should enter into the dietary in good quantity. Milk is an invaluable supplement to the diet.

LESSON 7

The Kidneys

The bodily functions, respiration and digestion, have one main purpose: that is, to provide a supply of energy by which the organism can maintain its vital functions. The blood system provides a means of transport, carrying nutritive substances and oxygen to the cells, and removing the waste product of metabolism, carbon dioxide, which is excreted from the lungs. Another waste product, not of metabolism in general, but of protein metabolism, is ammonia, derived from the breakdown of the nitrogenous portions of amino-acids, in the liver. Ammonia is very toxic, and is therefore first converted, in the liver, to the less toxic substance *urea*, and taken by the blood to the kidneys, whence it is excreted in the urine.

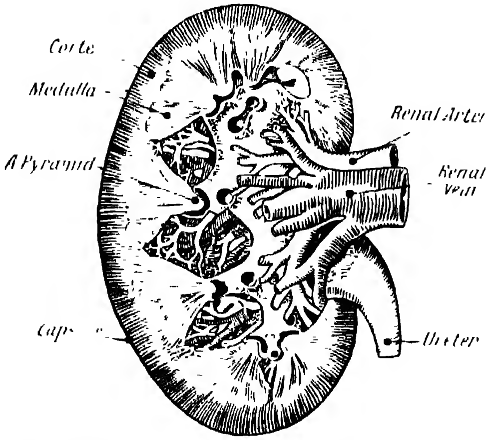
The removal of waste products is essential in order to maintain the constancy of the body fluids bathing the cells. The osmotic pressure, acidity, salt content, and so on, of these fluids must be kept within certain limits if the cells are to function properly. The control of the level of carbonic acid in the blood has already been described in Lesson 4, on Breathing. Apart from their task of excreting urea, the kidneys are also important in other ways in maintaining the constancy of the blood and hence of the body fluids as a whole.

Their purpose is to provide a selective filter through which excess of any particular substance in the blood is removed, whether it be a nutritive substance or the waste matter from the activity of the cells. The kidneys are a pair of organs lying at the back of the abdominal cavity; each consists of about a million minute tubules. One end of each tubule lies in the outer part of the kidney (the cortex) and forms a microscopic cup or capsule in which lies a tuft of capillary blood vessels. The tuft is known as a *glomerulus*. The other end of each tubule opens into a hollow space in the concave side of the organ. Fluid, i.e. urine, passing down the tubule, collects in this space and is drained away from it through the *ureter*, a tube 12 to 16 inches long which passes down from each kidney to end in the urinary bladder. Here the urine collects until discharged by the act of micturition.

The upper end of each tubule is blind, indented to form the cup enclosing the glomerulus; the walls here are very thin, but the walls of the rest of the tubule are formed of a single layer of secretory epithelium, the appearance of which varies in different parts of the tubule. Immediately after leaving the glomerulus, each tubule makes a number of convolutions in the cortex (the *proximal convoluted tubule*); it then runs into the *medulla*, the layer internal to the cortex, and back again to the cortex (the *Loop of Henlé*); in the cortex it coils once more (the *distal convoluted tubule*) and finally traverses the medulla, joining up with adjacent tubules, to open into the cavity of the kidney on a projection of the medulla, a *pyramid*.

In man there are about a dozen pyramids, but some mammals have only one. The total length of each tubule in the human kidney is about three centimetres. The *renal artery*, on reaching the kidney, breaks up into a number of arterioles, which run to the capsules. Each arteriole divides within the capsule to form the capillaries of the *glomerulus*, which join up again to form a vessel *which is still an arteriole*, with muscular walls; this fact is of importance in the functioning of the kidneys.

This second, or *efferent*, arteriole runs then to the rest of the tubule in the cortex and in the medulla, and breaks up into capillaries in close association with all parts of the tubule. These capillaries collect up into veins and extend to the *renal vein* by which the blood leaves the kidney.



SECTION OF A KIDNEY, with the principal parts named. Urine emerges from the tubules into the calyces, whence it reaches the ureter.

The actual filter in the kidney is the inner wall of the intucked end of the tubule, in close contact with the glomerular capillaries. The force for filtration is supplied by the blood pressure in the glomerulus, which is raised by the contraction of the walls of the efferent arteriole; if the bore of this is smaller than

that of the afferent arteriole, entering the glomerulus, pressures can be set up in the capillaries, which force part of the fluid of the blood through the capillary walls and the wall of the tubule, into the lumen of the tubule.

The molecules of substances dissolved in the plasma will also pass through into the tubule, provided they are not above a certain size. The molecule of *haemoglobin*, for instance, which is small as protein molecules go, will pass the filter, and in pathological states where there is haemoglobin present in the plasma, as distinct from the red cells, it will also appear in the urine. Molecules larger than this, however, cannot pass the filter, and of course the cells of the blood cannot.

The fluid in the lumen of the tubule will then consist of the blood, without its cells or its larger molecules of protein, but *with* the urea, salts, and glucose which are dissolved in the plasma. The composition of this fluid is very different from that of the urine, but it is converted into urine by the action of the cells lining the tubules. This is mainly a question of the reabsorption into the blood of the substances in the fluid which are not going to be excreted.

Glucose is normally completely reabsorbed in the proximal convoluted tubule ; in pathological states (*diabetes mellitus*) when glucose appears in the urine, this is because its concentration in the blood is so high that there is no time for complete reabsorption. In the Loop of Henlé the fluid in the tubule is concentrated by the reabsorption of water into the blood ; in mammals, but not in other vertebrates, this reabsorption means that the osmotic pressure of the urine may be raised considerably above that of the blood, a process involving work on the part of the tubule cells making the transfer.

Various salts are reabsorbed in the distal convoluted tubule, the amount depending on the composition of the blood at the time ; this is the part of the kidney responsible for maintaining the constancy in the level of salts in the blood. The concentrated fluid in the tubule is now *urine*, and contains *urea*, certain other substances also derived from protein breakdown, and those salts and other substances which have not been reabsorbed. Urine normally contains about 40 per cent. of solid matter, about half of which is *urea* ; but the concentration will vary according to the amount of water and the amount of protein which is taken in the diet. Sodium chloride is the main inorganic constituent.

The kidneys are controlled partly by the nervous system, partly by the endocrine system. Among their other functions they ensure that the total quantity of water in the body remains more or less constant, large amounts of dilute urine being produced if much water is taken, and a small volume of concentrated urine if water is scarce. The kidneys are essential to life, but there is a considerable margin of reserve in the normal working kidneys, not all of which will be active at any one time. If one kidney is removed, the other grows larger to compensate for the lost tissue.

LESSON 8

Endocrine Glands and the Hormones

MENTION has already been made of *hormones*, substances which are carried in the blood and which contribute to the control and co-ordination of the different organs and functions of the body. The two systems are not altogether distinct for, as will appear in a later Lesson, the working of the nervous system is itself partly hormonal, though on a different scale.

The production of hormones is also, in some cases, under nervous control. Speaking generally, the nervous system will be responsible for those co-ordinations which take place rapidly, while hormones will affect those that are slower or of long duration ; but this distinction is by no means always true, and very often the two systems work in close conjunction in the control of a single process.

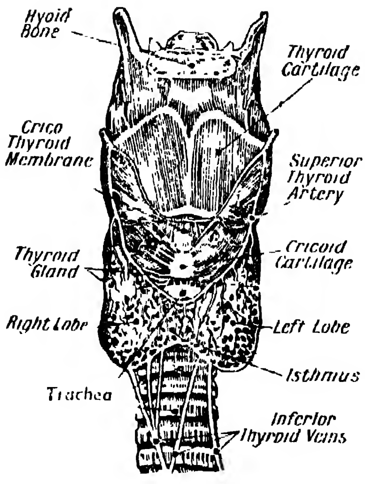
Glands are of various sorts. Lymphatic " glands " are part of the lymphatic system, but are not secretory in the ordinary sense. Other glands secrete juices which pass to their destination by way of a duct or tube ; such are the salivary glands, liver, and pancreas. Hormones are derived from glands that have no ducts, but pour their secretion direct into the capillary blood vessels surrounding their cells ; hence they are known as the endocrine glands, ductless glands, or glands of internal secretion.

The hormone *secretin*, which stimulates the secretion of pancreatic juice, has already been mentioned ; this was the first hormone to be discovered. Secretin is manufactured in the walls of the intestine. Most endocrine glands are morphologically distinct ; the more important are as follows :

(1) The *thyroid* gland, lying in the neck near the larynx. (2) The *parathyroid* glands, situated immediately behind the thyroid. (3) The *Islets of Langerhans* in the pancreas. (4) The *adrenal* bodies, near the kidneys. (5) The *pituitary*

body, a small but important gland lying within the skull below the brain. (6) Certain tissues in the *gonads*, the reproductive organs.

Hormones have certain qualities essential for their proper functioning. Chemically, they may consist of various substances, but must all be able to pass the walls of blood vessels readily, in order to reach, and to leave, the blood stream ; accordingly most are of small molecular size, though some are proteinaceous. There must be a means of eliminating them once they have taken effect, and hormones are either quickly destroyed, by appropriate means, in the tissues, or are excreted. Hormones are usually specific as regards their action on tissues, but not as regards the animal they are acting on. Hormones extracted from, say, sheep, will have the same effect on man as the hormones produced in the human body: this fact is of great clinical convenience.



THYROID GLAND. Important two-lobed ductless gland lying in front of the trachea

The thyroid gland is a bilobed organ lying in front of the trachea near the larynx. Its secretion, *thyroxine*, is a compound of *iodine* and the amino-acid *tyrosine*. It takes effect on all tissues of the body and controls the *rate of basal metabolism*, which is a measure of the energy needed to maintain the body at rest. The action of thyroxine (which apparently loses some of its iodine and so becomes another substance before it actually takes effect in the tissues) is to increase the rate of basal metabolism, that is, to cause the tissues to use more oxygen and more fuel, and so to produce more energy, simply to maintain the body in a condition of rest.

Since iodine is needed in the manufacture of its secretion, the thyroid gland accumulates iodine from the blood ; if not enough iodine is available the gland may become enlarged in an effort to maintain the correct level of secretion. Such a condition is known as a "simple goitre," as distinct from the type of goitre associated with over-activity of the gland.

Since it controls the general level of bodily activities, thyroid secretion also plays an important part in the development and maintenance of mind and body. A child whose thyroid gland is defective in function is stunted in mental and bodily development, and, unless given thyroid gland substance obtained from an animal, becomes a cretinous idiot. Adults with defective thyroid secretion are subnormal in both mental and bodily activity. Their fires of life burn sluggishly, and the activity of all functions of the body is impaired. If the gland is over-active, as sometimes happens, the individual is restless, excitable, and emotional, with rapid pulse and bodily wasting from excessive combustion.

Parathyroid Glands

These are two pairs of small bodies on either side of the trachea, behind the thyroid. The association with the thyroid is only anatomical, not functional. They produce a hormone which controls the level of calcium and phosphorus in the blood, and this is essential to life. Under-activity of the parathyroid glands leads to a low level of calcium in the blood, which prevents the muscles of the body from working properly ; over-activity of the glands raises the level of calcium in the blood at the expense of the bones.

The Islets of Langerhans

These were mentioned previously in connexion with the pancreas. They consist of groups of cells of an endocrine nature, embedded among the ordinary secretory cells of the pancreas which produce digestive juice. The hormone secreted by the Islets is *insulin*, which is one of the hormones controlling the level of glucose in the blood. The action of insulin is to lower the level of the blood sugar, by stimulating the liver to convert more glucose to glycogen (or alternatively, to release less glucose into the blood from its stores of glycogen).

Certain hormones produced in the adrenal glands and in the pituitary have an opposite effect ; the correct level of the blood sugar is maintained by the combined action of the two kinds of hormone, one tending to lower and the other to raise the level, striking a balance. The disease *diabetes mellitus*, characterised by a rise in the level of the blood sugar, can be caused by a failure of insulin production, and alleviated by the injection of insulin. The hormone must be injected, not taken by mouth, because it is a protein, though one of small molecular size, and would be destroyed by the action of pepsin and trypsin in the gut.

Adrenal Glands

The location of these glands is adjacent to the kidneys. Each gland is composed of two tissues, the *cortex* and the *medulla*, which have

quite different functions and indeed in fishes are represented by separate glands.

The *adrenal medulla*, the central tissue of the gland, is derived in the embryo from the *ectodermal* layer, which also gives rise to the nervous system. The hormone secreted is *adrenalin*, yet another derivative of the amino-acid *tyrosine*. The action of adrenalin is to reinforce that part of the nervous system known as the *sympathetic nervous system*, when there is a sudden emergency call on the bodily reactions. For instance, if a great muscular effort is called for, as in a necessity to fight, the adrenal medulla is stimulated by the nervous system to pour adrenalin into the blood stream. Immediately, in certain areas of the body, especially in the skin and alimentary tract, the blood supply is shut off so as to meet only the barest possible requirements of the organs concerned, while the supply to other parts whose activity is needed to the fullest extent - such as the heart, lungs, and voluntary muscles --is increased to a maximum.

In normal circumstances the varying needs of the organs for blood are met by the control of the sympathetic nervous system. Adrenalin provides the extra stimulus to meet an emergency demand This secretion has other modes of action as well It stimulates the liver cells which store glycogen to pour glucose into the blood stream and so provide for the increased demands of the muscles for fuel, and it also increases the rate and the strength of the heart-beat. There are other effects. An angry cat is an illustration of the action of adrenalin The erection of hairs and dilation of the pupils are also effects of the sympathetic nervous system, reinforced by adrenalin Adrenalin is responsible for the symptoms of fear in man, the "hair standing on end," and the whitening of the skin due to peripheral vaso-constriction Adrenalin is released only in emergency, and is destroyed quickly in the tissues by an oxidising enzyme.

The *adrenal cortex*, occupying the outer parts of the glands, is a tissue derived from the *mesodermal* layer of the embryo, which, in contrast to the medulla, produces several enzymes that are very important in the normal regulation of a number of bodily processes. The physiology of the secretions of the adrenal cortex is extremely complex, a great deal of work has gone on in recent years in an attempt to elucidate it. The hormones concerned are *sterols*, substances related to certain derivatives of fat. There are probably two main hormones concerned, *aldosterone*, which promotes the reabsorption of sodium chloride in the kidneys, and *hydrocortisone*, which is one of the hormones opposing insulin, and also has effects on the connective tissues of the body.

Various sterols which are derived from these hormones, or are made synthetically, have comparable effects; since some of the *sex hormones* are also sterols, disease of the adrenal cortex may lead to disturbance of some sexual characters. The adrenal cortical hormones are also of importance in enabling an animal to withstand stress, in ways that are not yet understood.

Pituitary Gland

This gland also is composed of two parts, the *anterior* and the *posterior lobes*, one derived from a part of the roof of the mouth in the embryo, the other from the floor of the brain Each lobe produces hormones having several functions, some of which are to stimulate the production of the secretions in other endocrine organs; the pituitary is thus a "governing gland," and it is interesting in that it is also closely connected with the brain.

The *anterior lobe of the pituitary* produces at least six hormones, which fall into two functional groups. First, there are three so-called "metabolic hormones" One of these is a hormone which promotes growth in young animals, if too much is produced, a child may grow into a giant, and if too little is produced the child may become a dwarf This hormone appears to be identical with the remaining hormone opposing insulin, acting with the *hydrocortisone* of the adrenal to raise the level of the blood sugar.

Secondly, there is a hormone which stimulates the thyroid gland, facilitating the release of thyroxine into the blood; under-activity of the thyroid may be due to lack of this pituitary hormone. Thirdly, there is a hormone which in a similar way acts on the adrenal cortex, stimulating the production of hormones from that gland. The other group of anterior lobe hormones acts on the sex organs in various ways, and will be considered later.

The *posterior lobe of the pituitary* produces two main hormones. One of them has a specific effect on the muscles of the *uterus* (the womb), causing them to contract, and is therefore of importance in childbirth The other has two, more general, effects: it acts on the kidneys to promote the reabsorption of water in the tubules, so cutting down the flow of urine, and it is concerned in controlling the "tone" of the blood vessels, tending to raise the blood pressure Though this hormone (*vaso-pressin*) affects the blood vessels in most parts of the body, it apparently does not constrict the arterioles in the kidney.

The hormones of the pituitary gland are either protein in nature, or polypeptides, some of the substances which go to build up proteins. The pituitary gland is richly supplied with nerve fibres from the adjacent parts of the brain, especially the posterior lobe, which is actually derived from nervous tissue in the embryo.

The Sex Hormones

Besides their primary function of producing the reproductive cells or *gametes*, the *gonads* also secrete hormones.

In women, and female mammals in general, the mechanism of the sex hormones is so complex in controlling the reproductive rhythms that the consideration of the subject is better left to the Lesson on Reproduction. In males the endocrine part of the *testes* consists of the *interstitial cells*, which lie between the coiled *seminiferous tubules* within which the sex-cells, the *spermatozoa*, are developed The interstitial cells secrete *androgens* or male sex hormones, which are sterols. These hormones are responsible for the appearance of the secondary sexual characters in males, such as the beards of men or the manes of lions. In the adult they are produced all the time in small quantities, and are not stored, but escape in the urine.

Even so brief a survey of the endocrine system in man brings out the fact that, apart from their great importance in ensuring the proper functioning of the body, some hormones may markedly affect those characteristics which one normally thinks of as indicating "personality"; the effect of too little or too much *thyroxine* is an obvious example. Thus it is clear that not only the health but also the behaviour of an individual depends on the integration of the endocrine system as well as on that of the brain.

LESSON 9

Structure of the Nervous System

THE nervous system consists of the *central nervous system*, the brain and spinal cord, together with the *peripheral nerves* and *ganglia* of various sorts. It is the main co-ordinating system of the body, and is so complicated both in structure and function, and indeed as yet so little understood, that the following account can form but a bare outline of the subject.

Anatomy of the Brain

The brain occupies the greater part of the cavity of the skull, the rest of the available space being occupied by its three layers of membranous coverings or *meninges*, the space between the outer layers being filled with the cerebro-spinal fluid. This fluid not only bathes the outer surface of the brain and spinal cord, but is found in hollow cavities or *ventricles* within the brain, and also in the central canal of the spinal cord. It acts as a kind of water cushion for the delicate structures it surrounds. A vast field of capillary blood vessels permeates the brain tissue fed by the large carotid arteries, which leave the aorta soon after its origin from the heart, while the return of venous blood takes place through large venous spaces or sinuses lying on the inner surface of the cavity of the skull.

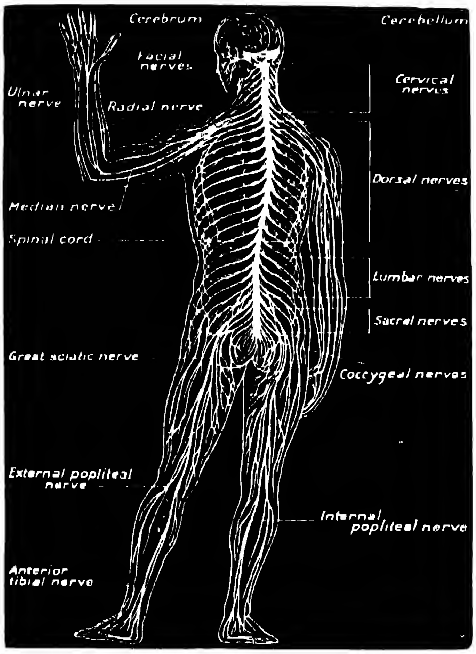
The brain has a complicated structure. It is divided into an upper and lower portion partially separated by a horizontal membrane extending across the skull cavity. Above the membrane lies the *cerebrum*. This is divided by a vertical fissure into right and left cerebral hemispheres, united across the fissure by a broad band of brain tissue composed of bundles of nerve fibres, the *corpus callosum*.

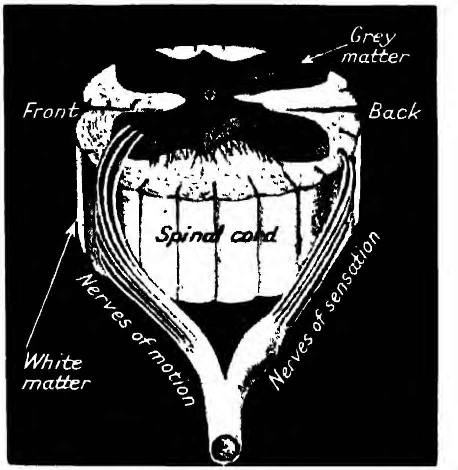
Below the horizontal membrane the brain stem or mid-brain extends down from the centre of the cerebrum. The stem in turn merges below into a rounded mass, the *Pons Varolii* or bridge Lying behind the bridge is a larger mass having two lobes and a striated appearance of its surface, this is the *cerebellum*. Below this level the bridge passes into the enlarged upper end of the spinal cord, the bulb or *medulla oblongata*. Where this merges into the spinal cord, the latter passes through the hole in the base of the skull, the *foramen magnum*, into the spinal column. The pons, or bridge, contains nerve fibres connecting the cerebrum with the cerebellum with the rest of the nervous system. In the bulb are situated the nerve centres which govern the action of the heart, lungs, and digestive tract.

Grey Brain Substance

The substance of the brain is of two kinds - a white substance formed of bundles of nerve fibres, and a smaller amount of grey substance which contains the nerve cell bodies from which the nerve fibres originate A layer of the grey matter covers the surface of the brain, and it is also found in isolated masses in the lower part of the cerebrum and cerebellum. The layer of grey matter on the surface of the brain is known as the *cortex*. Here the cells are arranged in layers of varying depth. In some parts they are 20 and more deep, the cortex being nearly a quarter-inch in thickness. From each cortical cell runs a main nerve fibre, the axon or *axis-cylinder*; these are collected into bundles to make up the mass of the interior of the cerebral hemispheres. Other shorter processes from the cells branch, intermingle, and come into close contact with similar processes from other cells. These processes are called the *dendrites*, and through them the cells are enabled to be in communication with one another.

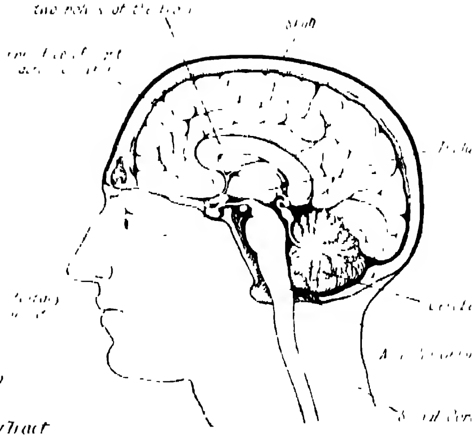
Structure of the Nervous System

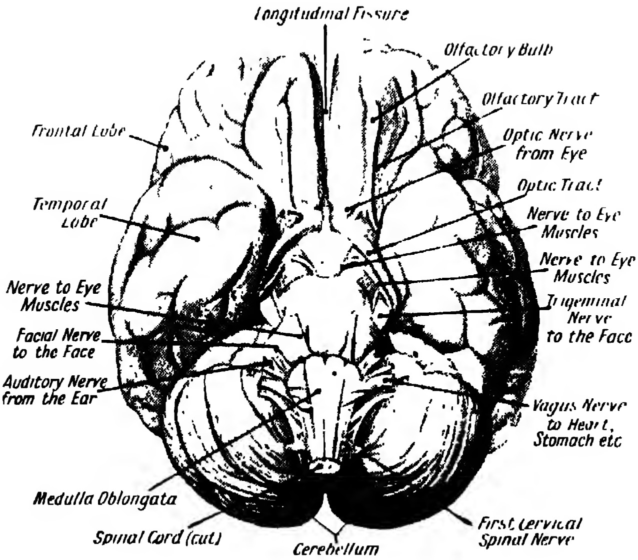




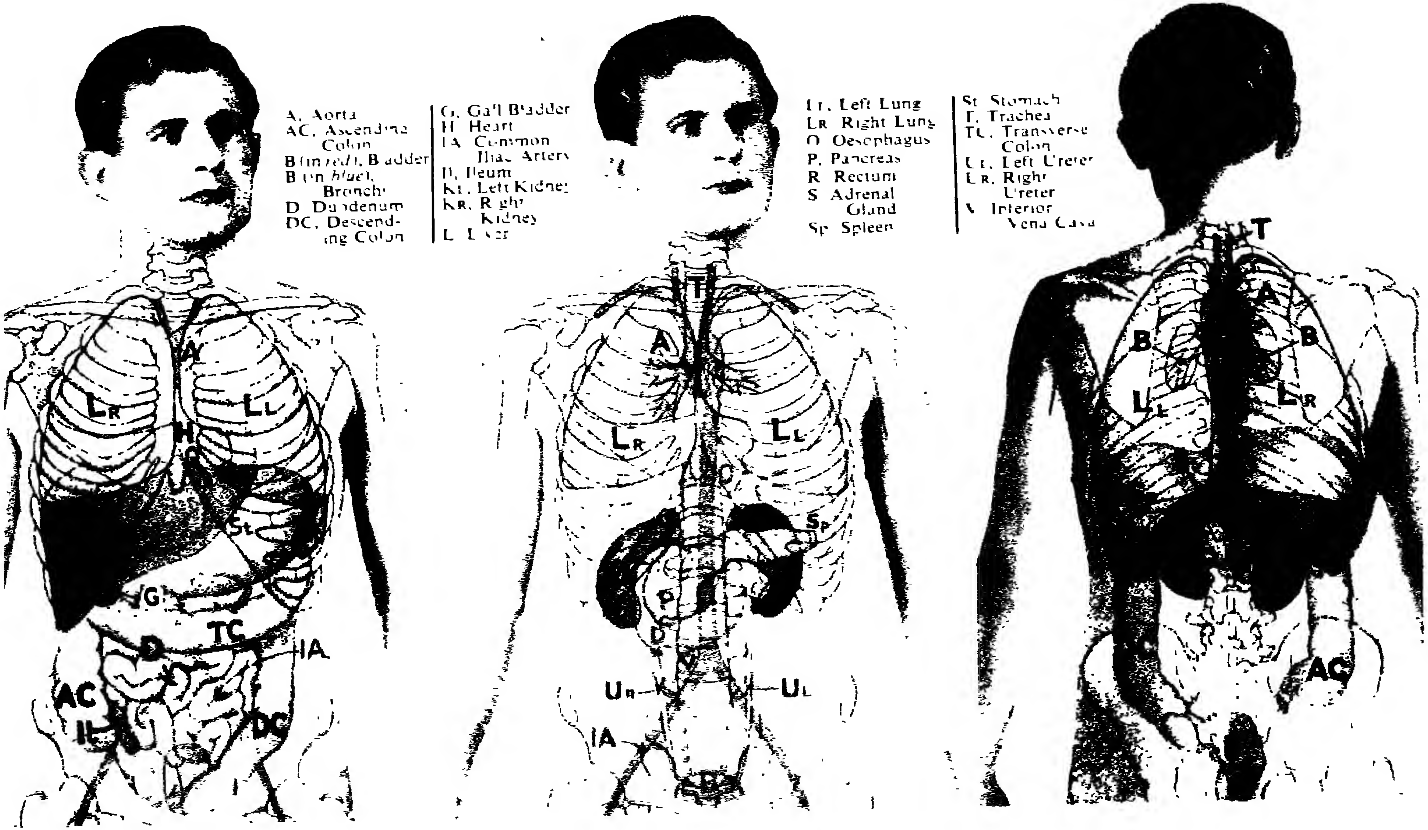
NERVOUS SYSTEM. Left, diagram showing the principal nerves of the central nervous system. Branches from these nerves form a network throughout the body, and connect with those of the sympathetic nervous system, which control the activities of the visceral organs, etc. Above, right, section of the spinal cord, showing the grey and white matter of which it is composed, with bundles of descending motor nerves and ascending sensory nerves.

LESSONS 1, 9, AND 10





VIEWS OF THE BRAIN. Above, section of the head showing the brain stem and the right half of the brain; the nerves to the head are not shown. Left, the brain viewed from below, showing the origins of the cranial nerves. It will be seen that the greater part of the cranial cavity is occupied by the cerebral hemispheres. The cerebellum is concerned with equilibration and with the co-ordination of movements. The medulla oblongata, or bulb, is the main line of communication between the higher part of the brain and the body. The thalamus is a relay-station for messages passing to the cortex of the cerebrum.



ORGANS OF THE BODY

On the left the internal organs are shown much as they might be revealed by removal of the covering integuments. In the central figure the intestines are removed with the exception of the duodenum in the loop of which the head of the pancreas is seen lying. From behind (right) the kidneys spleen and liver are seen in their positions nearer the dorsal surface, while the much greater mass of the lungs towards the back as compared with the front of the chest will also be noted

Sensory and Motor Areas

The extent of the cortex is greatly increased by being disposed in folds or convolutions, separated by fissures or *sulci* of varying depth. Some of these fissures separate the surface of the cerebrum into more or less distinct areas, and within each of these areas the cortical cells perform special functions in their capacity as the highest class of nerve operatives. Thus an area at the hinder end of the cerebral hemisphere subserves the function of vision, having nerve connexions with the eyes.

More anterior is an area—the motor area the cells of which are concerned in the control of voluntary muscular action. This area is divided up into smaller areas, each of which controls the movements of certain sets of muscles. Thus there is a centre for the arm, another for the leg, another for the face, and so on. The nerve fibres passing from these cells and conducting their message cross over the middle line at some lower part of the central machine, so that the limbs and face on one side are controlled by a motor centre on the other side. Hence an injury to one side of the brain will cause paralysis on the opposite side of the body. An area situated below the motor region is concerned with hearing. Close to it, again, is a speech centre. It is thought that the frontal lobes of the hemispheres are concerned with intellectual processes. The prefrontal areas, and those on the inner faces of the hemispheres, are involved in emotional reactions. This division of the cortex into areas, however, is not absolute, and knowledge of the functioning of the brain is still in its infancy. Each area has a two-way communication with the lower centres of the brain, and they are also interconnected. Vast numbers of nerve cells are involved.

The size, or total area, of the cortex is an index of intelligence and mental activity. As we ascend the evolutionary scale, so we find an increasing development not only in the size of the brain but in the thickness and surface extent of the cortex.

The masses of grey matter lying at the base of the cerebrum and composed of nerve cells and their processes are relay stations transmitting messages from the sensory centres in the bulb and spinal cord to the various parts of the cortex. Some in these centres link the cortex with the sympathetic or vegetative nervous system through which nerve impulses are conveyed from them to the circulatory and digestive and respiratory organs.

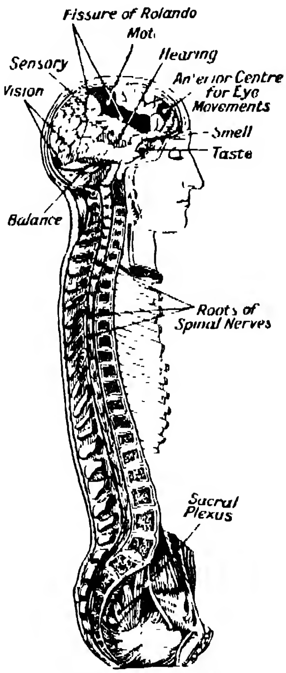
The Spinal Cord

This is the great main cable through which the administrative centres of the brain are in communication with the body. It is divided into two columns connected by a continuous bridge work. Grey matter forms the core of the cord and the white matter surrounds it. In the grey matter are cells; the white matter consists of nerve fibres uniting the cells of the various parts of the cord and the brain. The grey matter and nerve fibres of one column are connected up with those of the other column by fibres passing across the connecting bridge.

Cranial and Spinal Nerves

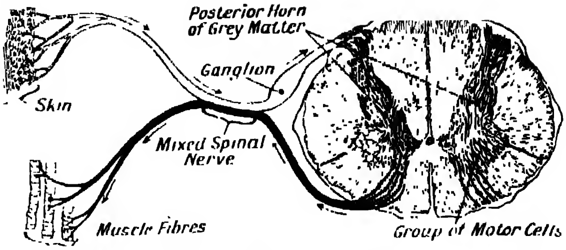
The great central nerve exchange communicates with the whole organism by a series of nerve cables consisting of bundles of nerve fibres bound together by connective tissue—the cranial and spinal nerves. Within the skull 12 pairs of cranial nerves emerge from the brain-stem, and of these, four pairs transmit incoming messages which convey the sensations of sight, hearing, taste, and smell. They are in communication through various relay stations with the cortex of the brain, the impulses they convey passing to the special areas where perception in consciousness arises. Other pairs of cranial nerves convey outgoing messages to the muscles of the face, of the eyeball, and the neck. These work in close collaboration with the special sense organs. One pair, the two great vagus nerves, forms the connecting link between the brain and the vital organs, the heart, the lungs, the stomach, and intestines. The nerve centres from which they convey messages are in the bulb.

From the spinal cord emerge 31 pairs of spinal nerves, the main cables for the innervation of each half of the body and the limbs. These nerves have two roots lying one in front of the other as they pass out from the spinal cord between the vertebrae, the small bones composing the spine. The anterior root contains nerve fibres arising from cells in the anterior part of the grey matter of the cord, and these fibres pass direct to muscles in all parts of the body. They convey outgoing (*efferent*) messages from the cortex, relayed



NERVOUS SYSTEM. The brain and spinal cord, with their nerves, form the central nervous system.

to them by cells in the cord, having previously crossed the mid-line of the body as they passed down through the brain. The posterior root contains fibres arising from the nerve cells of a small mass of grey matter lying on each root. These little masses are the posterior root ganglia. They are concerned with the reception and transference to the higher centres of incoming *afferent* messages, or sensory impulses, for processes from these cells also extend to the skin and other sensitive surfaces of the body. These messages, too, cross the middle line before they reach their destination in the cortex or the grey matter deep in the brain substance. Some of the fibres go no farther than to communicate with cell stations close to their entry into the cord; others pass up the cord and are relayed in the medulla to the cerebellum and cerebrum.



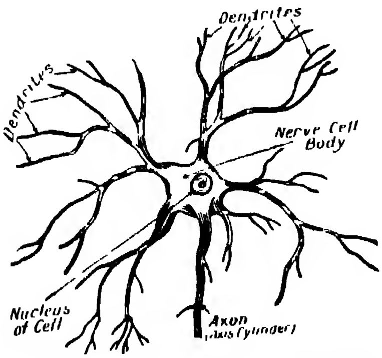
EFFERENT NERVE. The fibres shown here in black carry impulses from the spinal cord to a muscle fibre, and are termed efferent.

Anterior and posterior roots unite close to the spinal column to form trunk lines which, as they pass to their destination, give off smaller branches to supply different groups of muscles or sensory end-organs. The nerve trunks opposite the limbs are largest, because these parts naturally call for a generous nerve supply. Five pairs of nerves enter the arms, seven pairs enter the legs.

Structure of a Nerve

Now consider the more intimate structure of the nerve machine and its methods of working. The entire mechanism consists of a vast number of nerve units, or *neurons*, each unit consisting of a protoplasmic nerve cell with its branching processes, the dendrites the various units being held together and supported by a special connective tissue made up of cells and fibres, the *neuroglia*. Nerve cells vary in shape and size, but are mostly angular or star-shaped.

Branches radiate from the angles of the cell, and while most of these divide up into a number of tiny twigs or *fibrils*, one process, and one only, becomes the axis-cylinder or *axon* of a nerve fibre. The axis-cylinder is that process by which a nerve impulse leaves the nerve cell. Impulses in the dendrites pass towards the cell body. Soon after it leaves the cell this process becomes invested with a sheath of fatty material, and when it reaches its destination it breaks up into ramifying twigs. It is the presence of the fatty sheaths on the nerve fibres which makes the white matter appear white. Every unit is independent of every other unit. There is no actual continuity, but the dendrites and nerve cell body are in close contact with the terminal twigs of axis-cylinders, the nerve impulses passing across the gap from one unit to another.



NERVE CELL AND NEURON CONNEXION. Above, parts of one type of nerve cell. The main process becomes the axis-cylinder of a nerve carrying impulses from the cell, while the dendrites carry impulses into the cell.

The axis-cylinder depends for its efficiency as a conductor on the well-being of the cell of which it is a part. If it becomes severed from the parent cell, it undergoes degeneration and dies. A new axis-cylinder then slowly grows outward from the cell to replace it.

How Messages are Transmitted

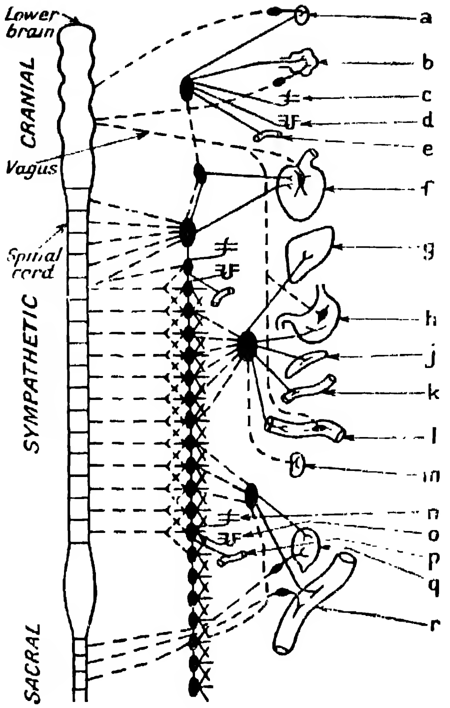
The entire nervous system consists of these units collected in larger or smaller masses and stations. A unit arranged to carry incoming messages to the central exchange has a transmitter or receptor—a special end-organ which may be in the skin, in a tendon, or in a special sense organ, such as the eye or ear or tongue. From the end-organ the nerve fibre passes to the first relay station, its parent cell, and so through other stations to its final reception in the cortex, or other centre. Outgoing impulses eventually converge on the *efferent* neurones of the spinal cord or brain stem, and pass along the axon to the end-organ lying amid the fibres of a muscle whence the stimulus to contract that particular muscle is conveyed to the actual fibres.

The nature of the nerve impulse itself is electrical; it can be measured with sensitive recording apparatus. The appropriate instruments show that an electrical change on the surface of the axis-cylinder is propagated down the nerve fibre: in the course of any normal activity many such impulses will follow each other down the nerve, the strength of all the impulses being equal, but

the *frequency* with which they follow one another varying. All activity in the nervous system is of this type, whatever the stimulus originally setting off the impulse. The result of the activity will depend on the connexions of the nerve cells involved. There is always some activity within the central nervous system, much of this presumably arising in the nerve cells of the brain without the necessity for stimulation from outside.

Where a motor nerve fibre connects with a muscle fibre, its end-organ is in close contact with the surface of the muscle fibre but not in actual continuity ; there is a gap, though a very small one. The passage of the impulse across this gap is not electrical but chemical or hormonal. When the electrical impulse arrives at the end of the motor nerve fibre, it causes the nerve fibre to release a substance, *acetyl choline*, which diffuses across the gap and excites the muscle fibre to contract. The acetyl choline, having done its work, is immediately destroyed by a special enzyme, *cholinesterase*, leaving the field free for the next release of acetyl choline as the next electrical impulse arrives down the nerve

The passage of nerve impulses from cell to cell within the nervous system takes place in a similar way, though certain cells of the sympathetic nervous system release *adrenalin* instead of *acetyl choline*. It is this hormonal transmission across the gap between two nerve cells (the *synapse*) which ensures that conduction along the pathways of the nervous system shall be in one direction only ; for though an axis-cylinder can conduct impulses in either direction if artificially stimulated, the passage of acetyl choline can take place only from the end of the axon to the dendrites or nerve cell body, never the other way round.



SYMPATHETIC NERVOUS SYSTEM Diagram showing general arrangement of the vegetative or sympathetic system. The broken lines indicate nerve fibres before they reach the ganglia the solid lines are fibres issuing from the ganglia iris ; b, salivary gland ; c, hair ; d, sweat gland surface artery ; f, heart ; g, liver ; h, stomach ; j, spleen ; k, visceral artery ; l, small intestine ; m, adrenal medulla ; n, hair ; o, sweat gland ; p, artery ; q, bladder ; r, colon.

Based on diagram in W. B. Cannon's "The Wisdom of the Body" (Kegan Paul)

Sympathetic Nervous System

Frequent allusion has been made to sympathetic nerves. This part of the nervous system governs many of the processes in the body over which one has no conscious control. Under normal conditions the sympathetic nerves keep the central nervous system informed of the conditions obtaining in the vital organs without bringing these conditions to the notice of the conscious self. Necessary adjustments are made in the higher centres of the brain to meet changing conditions, by means of messages sent out by the sympathetic route, and these are equally unconscious. The stopcock action of the smaller arteries, the rate and force of the heart-beat, and the muscular contractions in the walls of the hollow organs of the body, such as the stomach, intestine, and bladder, are brought about and controlled through the medium of this system. The secretory activity of the digestive glands is also under its control and regulation, and it is closely linked up with the activity of the endrocrine glands, especially with the adrenal medulla. In disease or disorder the messages from the vital organs arouse conscious disturbance and produce "symptoms."

The sympathetic system consists of a chain of *ganglia*, or collections of nerve cells, lying on each side of the vertebral column, and also of other outlying ganglia the chief of which is the large coeliac ganglion in the upper part of the abdomen. The sympathetic ganglia are connected to the spinal nerves by bundles of nerve fibres. They form relay stations for messages which pass to and from the spinal cord from and to the vital organs, the hollow organs, and the blood vessels. The fibres running between the periphery and the ganglia

but such modification would generally be disadvantageous. A large part of the nervous activity in the body never obtrudes on consciousness, for not all activity even of the cortex is connected with "thought."

An unending stream of nervous impulses is continually passing from the special sense organs, the muscles and tendons, the internal organs, the arteries, and the skin, to the brain, and thence in an outgoing stream to the vital organs, the muscles, tendons, arteries, etc. We carry out complex muscular actions; we sit down and get up, we walk, we balance the body on the feet and operate even highly skilled actions while our field of consciousness may be entirely occupied elsewhere. Most of these actions have to be learned by practice and experience. Later they become *habitual*, but it should be understood that this is not the same thing as being *instinctive*, or *reflex*.

Many of the actions of animals have been shown to be of the nature of "conditioned reflexes." One kind of stimulus becomes by repetition closely linked up with the reaction pattern of a previously acting stimulus, so that the animal reacts to the new one in the same manner.

The Cerebellum

This part of the brain has for its chief function the maintenance of the equilibrium of the body and the co-ordination of the action of the various groups of muscles brought into play in the performance of various movements. It is connected to the spinal cord and brain by three stalks containing nerve fibres passing to and from motor centres, the sensory centres of the ear, and the cerebral cortex. The mass of the cerebellum consists of myriads of nerve fibrils and relay cells arranged in central masses and in a superficial cortical layer.

We become acquainted with the external world through the medium of our sense organs, i.e. either the actual endings of processes from the sensory neurones, like the tactile receptors, or endings sensitive to changes in temperature, or to painful stimuli in the skin or in organs possessing groups or layers of special cells sensitive to the action of specific external agents. These cells include the olfactory cells situated in the nose, taste-buds in the tongue (both of these being stimulated by chemical substances), cells in the internal ear sensitive to sound waves, and cells in the retina of the eye sensitive to waves of light. Sensory nerve fibres, central relaying station, and outgoing motor impulses to the muscles provide the mechanism for suitable response to the stimuli so received, and enable the organism to adjust itself to the demands of the external world.

No less important is the adjustment of the internal environment. The activities of the viscera, the heart, lungs, stomach, and bowels, the urinary bladder and the sex organs, the digestive glands, liver, and pancreas—all these must not only be under constant control but their activities must be accurately adjusted to meet the varying demands of the external world on the organism as a whole. Every demand from without calls for an adjustment, great or small, in the working of the organs specially concerned in the responsive activity.

Though for convenience of description the nervous system may be divided into several parts, its functioning should be considered as a whole, for there is such close integration of its parts that activity in any of them can affect the rest. Which parts of this activity are concerned with what we call our conscious mind we simply do not know, except in so far as we do know the cerebral cortex is in some way involved. It cannot be solely involved, for it has such intimate connexions with the rest of the nervous system that it cannot be considered apart from the other centres. Nor is the whole of the cortex necessarily equally involved, for the removal of parts of it may produce surprisingly little effect. A vast body of knowledge on the subject is accumulating, but what and where the mind is has not yet been discovered.

LESSON 11

Protective Devices of the Body

In the preceding Lessons various devices have been described which ensure a certain chemical constancy of the blood and other body fluids; in order to effect this steady constancy in what may be called the internal environment, all the various systems of the body play their parts—brain, nerves, the digestive organs, the heart, lungs, and kidneys all working together towards this end. Physical factors such as temperature and osmotic pressure are also carefully controlled within narrow limits. Conditions vary from time to time under the influence of extraordinary factors in the external environment, but they remain relatively stable—thanks in large measure to the co-ordinating influences of the sympathetic nervous system. Though the physicians of older days failed to recognize this explanation of the tendency of the body to maintain itself in health, they were well aware of its existence. Modern medicine and surgery are successful only so long as they devise their methods in accordance with natural

restorative methods, and are so directed as to promote them.

The constancy of its internal environment enables an animal to be more independent of the external environment, being less affected by changes in the latter. In many there is a most careful control of the limits of variation, made necessary by the exacting demands of the highly developed brain to which man owes his success as an animal. Any variation in the chemical composition of the blood, or in temperature, will affect the brain before it affects any other tissue, and in so doing may upset the co-ordination of the rest of the body. This preservation of a more or less constant state in the nutritive fluids of the body may be regarded as a protective mechanism. But there are other special mechanisms of a protective kind called into action in response to special dangers, and these include some protective reflex actions.

Reflex Protection of the Eye

The eye is an organ of great importance and is much exposed to injury. It is a photographic camera having a lens, a shutter (the iris), and a photographic plate (the retina) made up of highly specialised end-organs capable of receiving impressions from waves of light and passing them on through the optic nerves to nerve cells in a definite area of the cortex of the brain. It can be moved in various directions by muscles attached to the globe and to the bony socket, which latter affords it much protection. Its exposed surface is covered by a highly sensitive membrane, the conjunctiva, which also lines the inner surface of the eyelids—quick-acting shutters ready to protect the eye.

The circular shutter over the lens, the iris, closes in over the lens in response to the intensity of light falling on the eye and to messages sent along a nerve belonging to the cranial set of the sympathetic system. This mechanism is a protection to the delicate structures in the retina, which can be damaged by intense light. The damaging effects of dust particles and harmful fumes must also be insured against. Pain is caused · and here, as always, pain is seen to be a protective sensory mechanism—tears are effused and serve to wash away or dilute the offending substance, and the eyelids blink in order mechanically to assist its removal. The blood vessels of the conjunctiva dilate and bring more lymph to repair the damage.

Why We Sneeze and Cough

Take now the respiratory organs, with their lining of sensitive mucous membrane. An irritating substance or gas enters the nasal passage. A sneeze is evoked. A sensory impulse has passed to the brain, and in response a series of motor impulses are sent out. A deep inspiration takes place followed by a blast of air forcibly sent out through the nose, and this may succeed in expelling the source of irritation. The membrane secretes mucus freely in order to dilute and enwrap it. Or the offending matter may find its way into the lower air passages. The breath, which might take it into the lungs, is immediately checked. The breath is held and the vocal cords close the entry into the larynx, and with a violent expiratory effort the offending substance is coughed up. Protective coughing also follows on inflammation of the lower air passages. The products of inflammation—dead cells, microbes, etc.- must be got rid of in order to keep the airways clear.

Stomach Disturbance

Vomiting is another good example of a reflex action designed to expel an irritating substance that has been taken into the stomach. The act is a highly complex one. In response to the nervous messages, the salivary glands pour out their secretion more freely in order that the saliva may help to dilute the stomach contents. The gastric glands which secrete mucus also secrete more freely in order further to dilute and enwrap the irritating substance. Breathing becomes more rapid, so that the breath may be held later ; the larynx is closed and the breath is now held so as to shut off the airway. The lower end of the oesophagus dilates, the sphincter muscle at the inlet to the stomach relaxes, and the stomach contents are forcibly expelled by the contraction of the diaphragm and abdominal muscles, increasing intra-abdominal pressure. A widespread motor impulse has responded to a local sensory disturbance.

Natural Repair of Damage

Repeated pressure or rubbing of the skin produces a callosity in the affected area. The outer epithelial cells, which are normally of a horny character, increase and form a thick horny layer or callous area, which serves to protect the underlying soft structures. Healing is, of course, a protective mechanism. The skin, say, has been broken. Nerve irritation is set up. The blood vessels in the area dilate and bathe the parts in cleansing lymph. New capillary vessels form in the gap, connective tissue cells develop around them to form a supporting structure, and the cells in the deeper layers of the epithelium, whose function it is to carry on incessant renewal as the upper layers of the skin are cast off as horny scales, take on an increased rate of growth in order to cover up the damage.

There are several mechanisms used by the body to preserve its inward heat. These are either brought quickly into action to meet sudden changes, or more slowly to meet gradual alterations in temperature. The putting on by

animals of extra hair as winter approaches is an example of a slow-acting protective mechanism of this kind. In humans the bronzing of the skin that develops under exposure to the ultra-violet rays of sunlight is a similar example of slow protective response. The pigment that forms in the skin prevents harmful penetration of the rays.

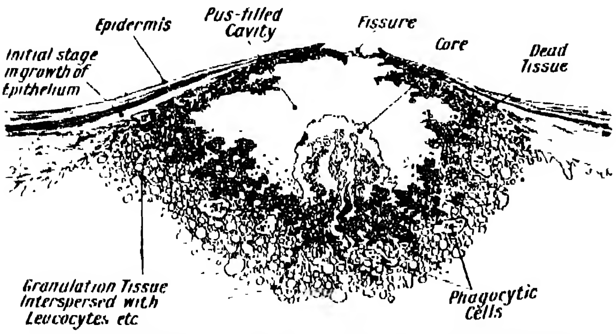
Defensive Role of the Skin

Man's most universal enemies are microbes Present everywhere in nature, many of these lowly forms of life, whose activities effect profound changes in their environment, are beneficent, even when that environment is the human body. Others are potent for harm, and may lie dormant in or on the body, awaiting an opportunity to invade their host and take on activities which may spell death. Such are to be found nearly always on the mucous membranes lining the mouth, nose, and throat. On the skin itself fatty substances are secreted which have anti-bacterial action.

If the integrity of the skin be impaired by injury, or the surface cells of the mucous membrane be damaged by irritation or their vitality impaired by faulty nutrition, an open gateway is provided for the bacteria to enter the deeper structures, or even the blood stream in the neighbouring capillaries. Having thus gained admission, they take on very rapid multiplication, increasing at the rate of many millions in a few hours. The defence offered may be confined to a purely local effort, or the whole machinery of the body may require to be brought into action.

A pustule on the skin is an example of a purely local reaction. Bacteria obtain entrance to the deeper layers of the skin owing to some slight injury or to a weakening of the general resistive powers. They attack the walls of the capillaries, which dilate and allow a free outflow of plasma through their walls, the plasma clotting as it exudes, while the lymph vessels in the vicinity become closed by the clotting of their contained lymph. The combined fibrinous network and the clotted lymph serve to shut off the invaded area from the surrounding tissues. White corpuscles (leucocytes) are hurried to the spot in great numbers, as are *lymphocytes*, from the neighbouring lymphatic glands. The latter may become enlarged and swollen as the result of their increased activity.

The leucocytes envelop the bacteria by means of exuding processes of theirp rotoplasm, and, having drawn the organisms into their substance, digest and so destroy them This is the process known as phagocytosis The *lymphocytes* do not engulf bacteria, but are very important in the production of antibodies, as described in a later paragraph. Leucocytes and lymphatic glands thus constitute the second line of defence. If this line of defence fails to check the infection, it may invade the general blood stream-- the condition known as septicaemia. To complete the story of the pustule or boil, pus forms, consisting of dead and living bacteria, leucocytes, and broken-down tissue material. This débris, as recovery takes place, is discharged from the centre of the inflamed area.



PHAGOCYTOSIS Sectional diagram of the core of a boil, showing the great multiplication of leucocytes waging war against the microbes.

Antitoxins and Sera

Despite the occurrence of a local reaction on the part of the host, some types of bacteria, when conditions are favourable, produce, as the result of their life processes, highly poisonous substances which, being absorbed into the blood stream, may produce serious disturbance.

Diphtheria is an instance There is severe local reaction in the mucous membrane of the throat and mouth, the common site of attack by the organisms of this disease The further encroachment of the enemy is prevented, but there is nevertheless absorption of much poisonous material produced by the bacteria. This poisons the nerves, especially some of the cranial nerves and the nerves which control the heart and lungs ; paralysis may ensue, and may prove fatal. The defence lies in the production by the infected body of an antitoxin able to counteract the action of the toxin. This substance can be obtained, as it were, artificially, by giving an animal repeated and increasing (though harmless) doses of the toxin, the latter being obtained by allowing the bacteria to grow in a broth. The animal being thus inoculated, the antitoxin is formed in the serum and is available for reinforcing the protective powers of the blood of the infected person.

Bacteria of some types may find their way into the general blood stream, and then a further protective process is called into action. It is obvious that the danger of such an invasion is a

very grave one, since the organisms may be carried to any vital organ, there to carry on their destructive work. The blood produces specific immunising substances or antibodies in the formation of which the *lymphocytes* appear to be of importance. These have the power of making the bacteria clump together into masses, the process being spoken of as agglutination. Other substances present in the serum serve, as it were, to complete the work of the antibody ; together they either bring about the dissolution of the bacteria or render the bacteria much more liable to ingestion by leucocytes.

The antibody is of a specific kind in relation to the type of invading organism, and since by inoculation of animals it can be produced in the animal's blood, it can be used in medical treatment to effect immunity against possible infection or to cure an existing infection.

These natural defences are in many cases dependent for their efficiency on the general health; so that if a good state of health is not maintained through proper diet and regular sleep and the taking of exercise, a vicious circle may be set up, an unhealthy body being more susceptible to disease.

LESSON 12

Process of Human Reproduction

THE individual organism is a link in a long chain of lives, and physiological life may be regarded as a circle in which a series of events is repeated over and over again. Egg cell, foetus, the newly born child, the adult, and again the reproductive cell, complete the unending cycle Thus the sex organs occupy a vastly important position in the scheme of physiology Nor is their importance limited to the reproduction of the species. They play a very large part in the development of the special sex characteristics and thus in psychological development. The internal secretions of the sex glands link up with other hormones produced by the pituitary gland.

Male Sex Organs

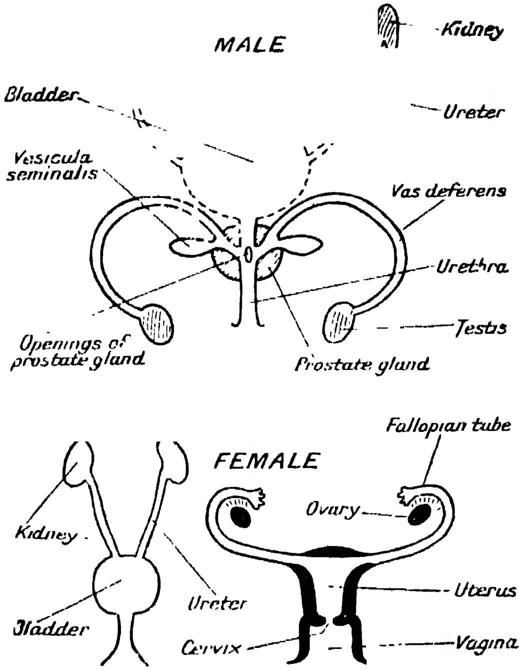
In the male the reproductive organs consist of two testes and the ducts which lead from them The testis is a glandular organ which shortly before birth descends from the peritoneal cavity of the abdomen into the scrotal sac, enclosed in a process of the peritoneal membrane. The reason for this is that the male sex cells develop best at a temperature rather below that of the rest of the body. The gland is divided into lobules, each of which consists of several convoluted tubes. These tubes end in ducts, and these unite to form a single much-convoluted tube, the folds of which form a small mass attached to the testis and called the *epididymis*. This tube is prolonged into a larger thick-walled tube, the *vas deferens*. This opens into the urethra behind the base of the penis, and provides the channel whereby the spermatozoa, having their origin in the cellular tubules of the testes, enter the urethra in the sexual act and are discharged. The process is assisted by the added secretions of two glandular bodies, the *vesiculae seminales*, which are outgrowths of the vas deferens and pour their secretion into it, and by the secretion of the prostate gland.

These secretions together make up the semen, which consists of vast numbers of spermatozoa suspended in a richly albuminous fluid. The spermatozoon is derived by development stages from the epithelium which lines the tubules of the testes It consists of a head, a short neck, a body, and a long, highly motile tail, by the lashing movements of which the sperm cell makes its way through the genital passages of the female to reach and fertilize the ovum. The head is flattened and oval, and contains a well-marked nucleus Spermatozoa are being continually formed in very large numbers during the sexual life, and are temporarily stored in the vesiculae seminales, whence they are discharged from time to time, either during the sexual act or by involuntary emissions. There are also to be found in the testis interstitial cells previously mentioned as producing the hormones which cause male characteristics.

Female Sex Organs

These consist of (1) the right and left ovaries, the functions of which are to produce the germ cells or *ova* ; (2) a Fallopian tube on each side, through which the ova pass to the *uterus* or womb, the organ in which the ovum develops into the foetus ; and (3) the vagina, the passage through which insemination occurs and through which the young animal is born. The ovary is a gland about the size of a large walnut. It consists of a fibrous stroma covered with a layer of cubical cells, the germinal epithelium, which extend here and there deeply into the stroma. The substance of the ovary is crowded with a large number of tiny rounded cells, the *oocytes* or primitive germ cells.

The oocytes become surrounded by other cells of similar origin, but not themselves germ-cells. These are called the *follicle cells*. Their function is to pass food substances to the ripening *oocyte*, which will become the egg cell. The follicle cells multiply till they form a mass enclosing a fluid-filled cavity ; the developing egg cell lies in a peninsula of follicle cells at the inner end of the cavity. The whole is known



HUMAN SEX ORGANS. Male and female reproductive system.
From "An Outline for Boys and Girls and their Parents," by courtesy of Mrs. Naomi Mitchison and Victor Gollancz, Ltd.

as a *Graafian follicle* These follicles can be seen projecting from the surface of the ovary. The vesicle, as it increases in size owing to increase in its fluid contents, reaches the surface of the ovary and finally bursts, and in doing so releases the ovum The egg cell then enters the Fallopian tube, a hollow tubular structure about 4 inches long. The inner opening of this tube communicates with the upper part of the interior of the womb ; its outer end opens freely into the general peritoneal cavity by an opening surrounded by delicate fringe-like processes, close to the ovary of its own side. The ovum is directed into the tube, assisted by the action of cilia lining the tube, and passes down towards the uterus. It is while the ovum is in the upper part of the Fallopian tube that fertilization is effected.

Process of Ovulation

The process of shedding an ovum is called ovulation, and in the human species it occurs once in about every four weeks After the follicle ruptures, it becomes filled up by the rapid multiplication of the follicle cells in the walls, forming a structure, the *corpus luteum*, which disappears after a time unless pregnancy supervenes on ovulation, when it persists during pregnancy and increases in size. The *corpus luteum* is an endocrine organ.

The ovum is a spheroidal cell surrounded by a transparent membrane. Its protoplasm is rich in fatty and albuminous granules, and it shows a well-marked nucleus. At birth there are about 70,000 immature oocytes, only a very small fraction of which reach maturity—perhaps 400 during the sexual life. Few of these, of course, become fertilized. Spermatozoa are produced on a still more lavish scale. In one sexual act it is calculated that more than 200,000,000 spermatozoa are discharged, and only one of these is able to effect fertilization. Nevertheless it is necessary that a mass of spermatozoa be present at fertilization, for they secrete an enzyme which dissolves away the follicle cells still adhering to the egg cell, so making it accessible for penetration by the fertilizing spermatozoon.

Reference should be made to the Course on BIOLOGY for details of what happens to the nuclei of the gametes before and during their fusion, and to the Course on ZOOLOGY for the history of the egg after fertilization, for this is essentially the same in man as in other mammals, though there are differences of detail.

Function of the Womb

The womb is a pear-shaped organ lying in the pelvic cavity between the rectum and bladder. It is about three inches in length, the upper portion about two inches wide. The lower end forms the neck or cervix of the organ, which projects into the cavity of the vagina The uterine walls are composed of layers of muscle, and though the womb is a hollow organ its walls are normally almost in contact. The cavity of the body of the womb is about an inch wide by an inch and a half long, and has three openings into it, one from the vagina through the cervix and one on each side into the Fallopian tubes. It is lined by a mucous membrane known as the *endometrium*, consisting mainly of tubular glands dipping into its substance from the epithelium which forms its inner surface. The function of the womb is entirely confined to the reception of the fertilized ovum and the lodgement of the growing foetus until it is sufficiently developed to be born. The endometrium is always in a state of constant change during the sexual life. Much of it is shed every four weeks during menstruation.

In the pregnant womb the lining membrane becomes highly specialised in order to embed and nourish the growing ovum, and the greater part of it is cast off after the child is born. The capacity of the womb to accommodate a full-term child, entailing its increase in size to about four times its normal length, and 20 to 30 times its normal weight, and the subsequent return of the organ to its normal size, are remarkable instances of the natural adaptive powers of the human body.

The vagina is the passage between the womb and the external opening between the lips or vulvae. The front wall is about three inches long and the back wall about an inch longer. The external opening is partly closed in a virgin by a special fold of mucous membrane, the hymen. At the upper end the mouth of the womb projects from half to one inch into the vaginal cavity. The cavity is lined with tough epithelium that has no glands in it, lubrication of its surface being effected by special glands near the vulvae. The rest of the wall is composed of fibrous and muscular tissue which permits of contraction and expansion in the course of sexual intercourse and parturition.

Menstruation

The function known as menstruation is part of the rhythmical sexual cycle, such as is found in some form in all female mammals. Every four weeks the womb becomes congested and its mucous membrane thickened. The more superficial layers of this membrane are then cast off, with blood from the ruptured blood vessels of the membrane. The functions of ovulation and menstruation are governed by the action of various hormones, produced in the anterior lobe of the pituitary and in the sex organs themselves.

Menstruation represents the end of a particular cycle. A few days after this, the anterior lobe of the pituitary secretes one of its sex hormones, which has a double effect on the ovary. First, it stimulates the maturation of one or more of the egg cells in the ovary, forming a large Graafian follicle. Secondly, it stimulates the ovary itself to produce hormones, *oestrogens*, which inhibit the formation of any more of the anterior pituitary hormone, and also bring about ovulation when the follicle is ripe. Immediately after ovulation, the anterior pituitary secretes a second sex hormone (a different one), which stimulates the formation of the *corpus luteum* within the follicle which has just shed its egg. The *corpus luteum* takes only a few days to form, and is an endocrine gland secreting a hormone, *progesterone*, which is of great importance during pregnancy. If the egg was not fertilized, the *corpus luteum* persists for about a week and then retrogresses; its disappearance coincides with the onset of menstruation.

The action of *progesterone* is, first, to inhibit any further ovulation, and secondly to bring about changes in the walls of the uterus (increased vascularisation and so on) which prepare it to receive the fertilized egg, or rather the young embryo. This implantation of the young embryo can take place only while the *corpus luteum* is mature, and accordingly conception can occur only between the time of ovulation, when the ovum enters the Fallopian tube, and the time of maturation of the *corpus luteum* (after this there would not be time for the embryo to reach the appropriate stage for its implantation). These facts provide the basis for the method of contraception which depends on calculating the "safe period"; there are, however, several complications.

The "safe period" will be immediately before, during, and immediately after the menstrual period. The spermatozoa have to swim up the female reproductive tract, possibly assisted by movements of the uterus and Fallopian tubes, but it is not certain how long they can survive once they are there; this may be a matter of several days, or more, which will accordingly reduce the "safe period" following menstruation, as active sperm may then still be in the Fallopian tube at ovulation. The calculation of the "safe period" before menstruation depends on knowing the date of the previous ovulation.

In most women the next menstrual period will begin about 16 days after ovulation; this may, but will not necessarily, mean that ovulation takes place 16 days after the beginning of the last menstrual period, if the total cycle takes 28 days There is variation not only between individuals, but also at different times in the same individual. To ensure conception as far as possible, intercourse should take place immediately before, or at the time of, ovulation.

If fertilization does take place, the *corpus luteum* persists throughout pregnancy, maintaining a secretion of *progesterone* which ensures that there shall be no further ovulation or secretion of the anterior pituitary hormones just mentioned. It also keeps the uterus in the correct condition for the nutrition of the foetus, well vascularised and in such a state that it does not easily respond to any secretion of *oxytocin* from the posterior lobe of the pituitary.

Furthermore, progesterone brings about an enlargement of the mammary glands, which will eventually secrete milk under the stimulation of a third sex hormone of the anterior pituitary. In the later stages of pregnancy the *placenta* may secrete *progesterone* and so take over the functions of the *corpus luteum*. When this secretion ceases at the end of pregnancy, *oxytocin* is able to take effect on the uterine muscles and so bring about parturition. The newly born baby is connected to the placenta by the *umbilical cord*, which consists of the stalk of the *allantois* and other membranes, and their blood vessels.

Twins may be the result of shedding more than one ovum at ovulation, or may be the product of a single developing fertilized egg. In the latter case they are spoken of as "identical," for they share their genetic make-up in common; such twins must therefore be always of the same sex. Twins resulting from two ova are no more similar than any other brothers or sisters.

LESSON 13

The Human Machine in Action

The human body can be regarded as a machine with powers of motion and locomotion; a system of muscular engines exert their power on a system of levers or, in engineering parlance, crank-pins. Though the whole equipment of muscles and levers is present in the new-born child, their use has to be learned. From the earliest efforts to grasp an object, to balance the body on its two legs, to take the first few faltering footsteps, to utter the first words, dozens of muscles have to be set in motion at the right instant and in the right order, and with the right amount of strength. Later we acquire the ability to run and jump and to use the fingers for finely adjusted movements; we achieve proficiency in sport and games calling for the very accurately co-ordinated action of scores of muscles timed to function to the fraction of a second; and by constant practice we develop a high degree of skill in the pursuit of some handicraft.

Muscular Contraction

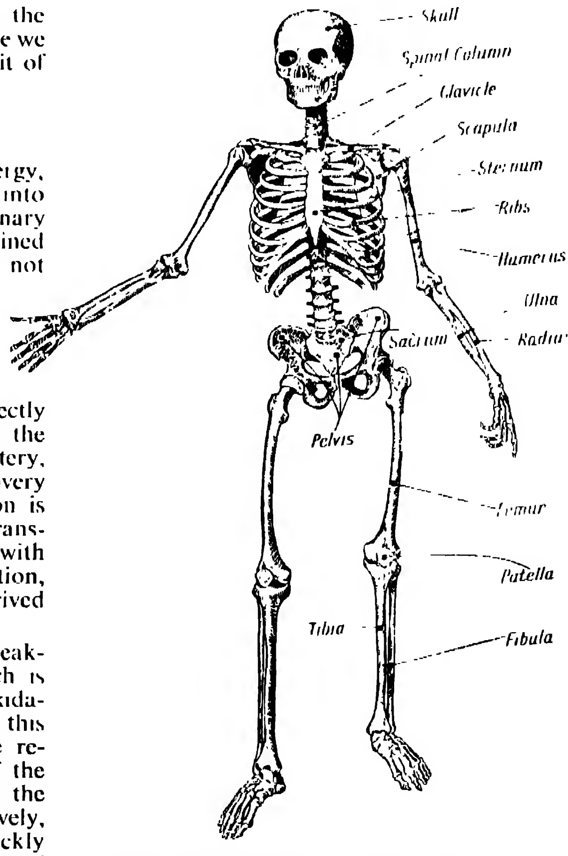
A working muscle uses a good deal of energy, though not all the energy used is converted into work The muscular efficiency of an ordinary man is about 20 to 23 per cent.; that of a trained athlete may reach 30 per cent Energy not converted into work appears as heat, which in mammals and birds is used in maintaining the body temperature.

The energy used by a muscle is supplied ultimately by the ordinary processes of tissue respiration, but not directly so. The actual process of contraction in the muscle fibres is still surrounded by mystery, though something is known of the recovery processes. The energy used in contraction is supplied by a series of cyclical chemical transformations—substances are broken down, with the release of energy used in the contraction, and then built up again using energy derived from the next cycle, and so on.

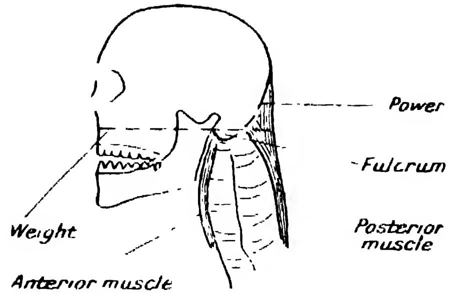
The last of these cycles involves the breakdown of the carbohydrate *glycogen*, which is stored in muscles, into *pyruvic acid*. The oxidation (by respiratory processes) of part of this *pyruvic acid* enables the rest of it to be reconverted to *glycogen*; the total level of the *glycogen* can be made up from *glucose* in the blood. When a muscle is working actively, oxygen cannot be brought to it as quickly as is needed: then the *pyruvic acid* is converted to *lactic acid*, which accumulates in the muscles and may appear in the blood (another reason for the necessary buffering of the blood to prevent changes in its acidity). Later, when the muscle is at rest, oxygen will be brought which will allow the *lactic acid* to be reconverted to *glycogen*. Such a condition, when *lactic acid* accumulates to be dealt with later, is known as *oxygen debt* Panting after exercise is due to the increased respiration rate needed to bring more oxygen, to pay off the debt in the tissues

Co-ordination of Muscles

Perfect adjustment in timing and strength can be effected only by sets of muscles acting reciprocally, each set having to give and take as the other takes and gives. Thus, as a simple

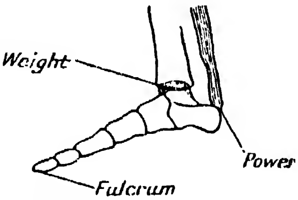


HUMAN SKELETON. The main divisions of the skeleton are the axial and appendicular skeletons, the former including the skull, vertebral column, breast bone, and ribs, and the latter, the bones of the limb girdles and the limbs.



LEVERS IN THE HUMAN BODY. The skull is a lever of the first order.
Sir A. Keith's "Engines of the Human Body"

example: when we bend the elbow, the biceps muscle attached to the front of the forearm contracts, and the triceps muscle, extending along the back of the arm and attached to the back of the elbow, relaxes. When we again straighten the elbow, the mechanism is reversed The resultant movement is therefore steady and smooth To enable the central nervous system to feel what each set of muscles is doing, special end-organs are set among the muscle fibres and in the tendons or fibrous attachments of the muscles. From these receptors nerve fibres convey messages to the central nervous system, from which messages pass to the opposing muscles



HUMAN FOOT. A lever of the second order.

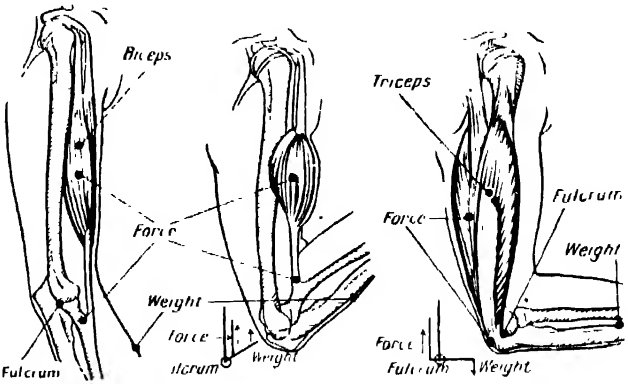
To take a single step, 300 separate muscles have to be set going by nervous stimulation from the spinal cord, and messages are being sent to the brain from each of these. Constant functioning causes the controls to become automatic. If we do bring conscious interference to bear, the movements are less smooth.

The actual work done by the muscles is greatly enhanced by the fact that the bones on which they exert their pull form a system of levers. Examples of the three orders of levers are found in different parts of the body. In the first order we have one end of the lever applied to the point of resistance or weight; at the other end the force is applied, and the fulcrum is between the two The nearer the fulcrum is to the resistance, and the longer the power arm, the greater will be the force exerted by a given effort. At the same time the movement effected is at a slower speed than when the fulcrum is nearer the point of application of the power.

Nodding movements of the head on the spinal column illustrate the point. The greater part of the weight of the skull lies in front of the articulation of the skull on the spine. The pull of the powerful muscles at the back of the neck acts on the skull well behind this point; the opposing muscles in the front of the neck are not only weaker, but are attached to the skull immediately in front of the fulcral point. Nodding and side-to-side movements call for less muscular force, but greater speed.

As an example of the second order of levers, the foot can be chosen. The bones of the foot form an arched or bent lever, and the weight of the body rests on the summit of the arch. The pad under the toes acts as the fulcrum, and the distance between the fulcrum and the point at which the weight is applied is greater than the distance between the fulcrum and the tip of the posterior arch of the lever, where the power is exercised by the powerful muscle forming the calf of the leg, and attached to the heel by the tendon of Achilles. The anterior pillar varies in length in individuals Where it is shorter than usual it is designed for greater power and less speed, and vice versa. Thus a sprinter usually has a long foot, a heavy man a short one. Flattening of the arched lever does not necessarily decrease either speed or power So-called flat-foot trouble is due to lack of mobility in the small bones of the arch. There are 17 small muscles in the foot, which should be used to maintain its shape.

As an example of a human lever of the third order, take the forearm and hand Here the fulcrum is the elbow, the weight is applied at the hand end, and the power is applied between



HUMAN ARM. Forearm and hand constitute a lever of the third order, in which the fulcrum is the elbow, the weight is applied by way of the hand, and the power is applied between the weight and the fulcrum by the brachial muscle pulling on the upper end of the forearm

the weight and the fulcrum by the brachial muscle attached to the front of the arm bone and pulling on the upper end of the forearm. Here the power is applied at a point so close to the fulcrum that it works at a great disadvantage as regards strength ; but what is lost in power is gained in speed. In the act of climbing, the lever action is reversed. The weight now acts at the top of the arm bone, the forearm is fixed, the fulcrum is at the elbow, and the biceps muscle acts at slower speed, but to a greater advantage in strength.

BOOK LIST

General. *The Human Body*, Sir Arthur Keith (Home Univ. Library) ; *Engines of the Human Body*, Sir Arthur Keith (Williams & Norgate) ; *Living Machinery*, A. V. Hill (Bell) ; *Manual of Human Physiology*, Sir Leonard Hill (Arnold) ; *An Elementary Text-book of Anatomy*, H. E. Clark (Blackie) ; *How Your Body Works*, G. H. Bourne (Sigma) ; *The Wisdom of the Body*, W. B. Cannon (Kegan Paul) ; *Human Physiology*, K. Walker (Penguin Books) ; *Introduction to Physiology*, W. H. Newton (Edward Arnold) ; *Biochemistry*, P. H. Jellinck (English Univ. Press).

Bodily Organs. *Your Breath and Your Health*, I. M. Pearlman (Putnam) ; *Physiology and Pathology of the Blood*, R. Norris (Murray) ; *Sex*, Prof. P. Geddes and Sir J. Arthur Thomson (Home Univ. Library) ; *The Study of Heredity*, F. B. Ford (Home Univ. Library) ; *The Brain and its Mechanism*, Sir C. Sherrington, O.M. (Cambridge University Press) ; *Man on his Nature*, Sir Charles Sherrington (Penguin Books).

Health. *The Body and its Health*, W. Cullis and M. Bond (Nicholson & Watson) ; *Health and a Day*, Lord Horder (Dent) ; *Handbook of Hygiene for Students*, C. G. Eastwood (Arnold).

Food and Vitamins. *Food, Health, Vitamins*, R. H. A. Plimmer and V. G. Plimmer (Longmans) ; *Food Values at a Glance*, V. G. Plimmer (Longmans).

PHILOSOPHY

Here in brief compass are surveyed the great philosophical systems which must ever rank among the most sublime achievements of the human intellect. Further mention of the principal philosophers will be found in the Courses devoted to CLASSICAL LITERATURE (*Vol. 1*), ENGLISH LITERATURE (*Vol. 2*), *and* FOREIGN LITERATURE (*Vol. 4*), *but it must be emphasised that a study of the original texts—some of the most important of which are given in the Book List printed at the end of the Course—is essential to a proper appreciation of Philosophy.*

15 LESSONS

LESSON 1

The Meaning and Mission of Philosophy

There is doubt in many people's minds as to what Philosophy is about. This doubt may be resolved at once by a formal definition, which, although it does not take us very far, does at least serve to indicate the scope and nature of the subject. The object of philosophy may be defined, then, as an attempt to understand the universe as a whole —not, like physics or biology, a special department of it, but the whole mass of data to which the moral intuitions of the ordinary man, the religious consciousness of the saint, the aesthetic enjoyment of the artist, and the history of the human race, no less than the discoveries of the physicist and the biologist, contribute.

Much doubt exists as to the value of philosophy, nor can it easily be set at rest. Consider philosophy first in terms of its practical results. If life is an art, philosophers are not its artists, nor does a study of philosophy confer a knowledge of its technique. If life be regarded as a chess problem, philosophy does not provide a ready-made solution; while in so far as philosophers have claimed that the study of their works fitted the student for the business of life, the claim is largely unfounded.

That a knowledge of philosophy does not directly affect the business of living, an observation of philosophers will readily prove. The political philosopher is not noticeably better either as a citizen or as a statesman than his neighbours. The metaphysician cannot provide an agreed and demonstrably correct answer to our questions as to how the universe started, whether it works mechanically, whether there is a God, or whether there is such a thing as matter. The morals of the ethical philosopher are not of necessity superior to those of the plain man. In particular, he is not always remarkable for what is known as the "philosophic temperament." He is no more serene than the man in the street, being just as likely to betray ill-temper when he breaks a shoe-lace or when he misses his train.

A knowledge of all the ethical systems that have been propounded since man began to moralise will not make the philosopher a good man, and thinking will certainly not make him a happy one. It is even possible that happiness and knowledge may be in some ways incompatible, so that we are still to-day faced with the choice which the Greeks propounded long ago, the choice of being a happy pig or an unhappy Socrates. This fact need not cause distress, since the question whether happiness is the only, or even the chief, desirable thing is itself a philosophical question.

Philosophy and Science

Or consider the theoretical achievements of philosophy contrasted, for example, with those of science. Science shows a steady march of ordered progress, in which each scientist builds continuously upon the foundations laid by his predecessors. As a result, science has accumulated a formidable body of knowledge, which in countless ways has changed the face of the world, has brightened human life, and lightened human suffering. But with philosophy it is not so. Not only are the conclusions reached by different philosophies hopelessly at variance, but there seems to be no sort of agreement even as to the subjects which should be discussed. If philosophers do not know what they are looking for, how, the student may be tempted to ask, are they to be expected to find it?—at which point he will call to mind some time-honoured gibe about a philosopher being like a blind man in a dark room looking for a black cat that isn't there.

Nevertheless philosophy is one of the most valuable, although most difficult pursuits of the human mind, and the greatest human thinkers have devoted their lives to its pursuit. What answer, then, can it make to the charges implied in the preceding paragraphs? First, it should be emphasised—and herein lies the answer to the charge—that philosophy reaches no agreed results, that philosophy is not the accumulation of facts, but an inquiry into the *meaning* of facts. Pooling the experiences of the scientist, the saint, the artist, and the common man, it asks what must be the nature of the universe in which such experiences are possible. It is interested, in other words, not so much in the facts as in their significance. Thus it establishes principles of selection and rejection whereby some of the facts are shown to be important, while others are rejected as trivial or condemned as illusory; it assigns values, too, and assesses the universe in respect of its beauty or its goodness. Philosophy does not pretend to help a man to earn his bread and butter.

Now, this search for meaning and significance, this task of assessment and valuation, involves considerations of a highly personal character. One man will detect common elements where another observes only a chaos of differences; some will recognize the hand of God in what others insist is a haphazard collection of fortuitous events. Thus, while the facts are

the same for all, the conclusions which are based upon them will be different. Nor need this difference be deplored. Just as it takes all sorts of men to make a world, so does it take all sorts of minds to find the truth about the world, and philosophy is no more to be dismissed because each philosopher has a different system than morality is to be invalidated by the fact of differing moral judgments, or religion by the innumerable variations of religious belief.

Discovery of Order

Nor, secondly, is it the fact that there are no matters in regard to which philosophers are agreed. At first sight the world is a chaos of different things, and as such it undoubtedly appeared to primitive man; but directly speculation began, the mind passed beyond the stage of regarding the world as a mere chaos and sought for principles to order the chaos. However various the facts of nature, it very soon becomes evident that there is at least some degree of relation between them. An unsupported stone falls not once or twice only, but always. The sequence of day and night and of the seasons, the apparent movement of the sun, the growth of crops—these all display some degree of order and hints of interdependence. So unmistakable is this order that it came to be recognized long before the birth of science, the business of which is to discuss the relations between the facts of nature, so salient are these relations that the mind must recognize them directly it begins to think at all Whatever else is uncertain, the fact of order in nature cannot be gainsaid.

Seeing the Universe as a Whole

There have been many philosophers who declared that there is no external world, many who have held that if there is an external world nothing can be known of it, while others have maintained that mind is only an accident, looking on at the matter which produces it but never yet was there any philosophy that did not admit, to some extent at any rate, this idea of order. The order is outside us, say some thinkers; there is nothing whatever outside us and the order is within us, say others; the order applies only to some things, say the savage and the superstitious; order is universal, says the thinker but none of them will deny the existence of order.

Once the mind has begun to recognize traces of order here and there, it has a way of going farther afield, in order to see how far this principle may be traced. The whole history of science is a history of the ever-widening demonstration of the existence of order, and it is the profound belief of most men of science to-day that order is universal. As a matter of fact, however, philosophers have not waited for, let us say, the perfecting of meteorology in order to assent to the proposition that order is universal.

In this way philosophy has pointed the way to science. It has not so much discovered facts for itself as suggested hypotheses for the scientist to investigate. In a word, it has put up signposts indicating the routes along which science should proceed, and of these the first, the most important, and the one with regard to which all philosophers are agreed, is the signpost of order.

Mental Discipline

To return to the defence of philosophy, it may be noted that the mental discipline involved in philosophical pursuits broadens, strengthens, and refines the mind. Philosophy will take a common object and show that much less is known about it than is expected. A chair, for example, which appears to common sense to be four wooden legs surmounted by a square wooden seat, can be shown by philosophical reflection to be an idea in the mind of God, a colony of souls, a collection of sense data, a piece of our own psychology, or a modification of the absolute. Philosophy can give very good reasons for supposing that the chair is each and all of these things; and although one cannot definitely prove which of them it is, one can at least become quite certain that it is not merely a chair.

From this point of view the value of philosophy lies mainly in its uncertainty. The man who has no acquaintance with philosophy goes through life imprisoned in the prejudices, the preferences, and the habitual beliefs derived from the society in which he happens to have been born and the period in which he lives. If he is born in a Mahomedan country, he thinks it right to have several wives; if in England, only one. If he is born in 400 B.C., he thinks the sun goes round the earth; if in A.D. 1900, he takes the contrary view. None of the views which he holds is the result of independent thought; all are the product of convictions which, having grown up without the consent of his reason, are merely the reflection of the conventions and prejudices of his age.

To such a man the world tends to become dull and obvious. Common objects provoke no questions, and unfamiliar possibilities are contemptuously rejected. Philosophy, which raises doubts about what has hitherto been taken for granted, keeps alive the sense of wonder and restores mystery to the world. By diminishing our certainty as to what is, it enormously increases the possibility of what may be. Thus it makes life more interesting, not because of the answers it provides to the

questions it raises, but because, by the mere process of raising such questions, it liberates us from the dominance of the actual and sets us on the threshold of the region of emancipating thought.

Real Function of Philosophy

The real function of philosophy, a function which philosophy alone can fulfil and which constitutes its ultimate justification, is to act as a clearing-house for all human knowledge. The scientist, working away in a little watertight compartment, devotes his attention to a certain section of the universe. Thus enclosed, he arrives at more or less definite conclusions without stopping to think what relation they bear to the conclusions reached by other scientists working in *their* watertight compartments. This is not a criticism of the scientist; cosmic correlation is not his business, but it is not to be wondered at if some of the conclusions clash. Hence arises the need of a clearing-house in which the results arrived at by the various sciences can be pooled and collated, in order that, looking at them as a whole, we may be able to infer what kind of universe it is that we live in, and hazard a guess at the destiny of human life.

These pursuits are not without their practical effect upon the men who pursue them. Those who give time to the study of such impersonal questions are bound to preserve something of the same impartiality and freedom in the world of action and emotion. Since a consideration of fundamental questions shows how little is certainly known, the philosopher is ready to grant the possibility that contrary views may have as much or as little truth as his own. Thus philosophy generates an attitude of tolerance which refuses to regard the distinction between right and wrong, good and evil, truth and falsehood, as identical with that between things done and views held by oneself and the contrary actions and thoughts of others.

The fact that no agreed answer has yet been discovered to the most fundamental questions cannot but suggest to the honest thinker that all systems hitherto constructed are in some degree false. Those who have no tincture of philosophy are inclined, on all questions not susceptible of proof, to supply the place of knowledge by converting other people's conjectures into dogmas. The philosopher, on the other hand, will admit that even his so-called knowledge is conjectural, and will regard all fanaticism, bigotry, and dogmatism not only as an offence against good manners but also as a betrayal of the truth. Thus it is for the sake of the questions themselves and of the methods with which it pursues them, rather than for any set of answers that it propounds, that philosophy is to be valued

Through the greatness of the universe which it contemplates, the mind itself achieves greatness. It escapes from the circle of petty aims and desires which for most of us constitute the prison of everyday life, and, forgetting the nervous little clod of wants and ailments which is the self, is elevated into communion with that which is greater than the self. On the practical side, this greatness of the mind generates qualities of tolerance, justice, and understanding, in the growth of which lies the chief hope for the world to-day.

LESSON 2

The Ideal State of Plato

A word of warning must now be given: philosophy is exceedingly difficult. It rejoices in technical terms and hair-splitting distinctions; it uses subtle and refined arguments, and one finds it often hard to understand why just those particular questions which are discussed have been selected for discussion. Not to be lightly attempted by any, philosophy should always be avoided by some.

In the following series of Lessons the student may form a general conception of the main problems which philosophers have discussed and of the reason why they *are* problems; some of the main systems of philosophy are introduced, together with the basic conclusions of the great philosophers.

Beginning with a brief consideration of the Greek philosophers Plato and Aristotle, making a survey of Kant's *Theory of Knowledge*, of philosophical Idealism, and of materialism, the series ends with some of the subjects which are being discussed by philosophers at the present time.

Plato (427–347 B.C.), pupil of Socrates (470?–399 B.C.), was contemporary with Aristotle (384–322 B.C.).

Dialogues of Plato

No apology is made for beginning with a consideration of the works of Plato. Plato is from several points of view an ideal philosopher for those who are studying the subject for the first time; and this for two reasons. In the first place, all the main philosophical problems which are discussed by subsequent philosophers are raised for the first time in Plato's works. They are raised clearly and attractively; and apart from the fact that the solutions which

Plato propounded are intrinsically quite as important as those suggested by any subsequent thinker, a study of their treatment by Plato provides one of the easiest paths into the philosophical maze.

Secondly, Plato is the greatest literary artist of all Western philosophers. He writes not only with clarity but also with charm, and *The Republic* of Plato is an exceedingly attractive book apart altogether from its great philosophical importance. Its literary grace and the power of its thought combine, in the view of many, to render it the greatest single book in the world. No apology is therefore required for following its line of thought with some degree of closeness.

The teachings of Plato are cast in dialogue form. The dialogues are discussions, usually between Socrates and a few followers, on such subjects as the nature of love, temperance, or courage, or on the destiny of the human soul They vary widely in dramatic interest. The earlier ones aim at freshness of dramatic portraiture, and attempts are made to introduce differences of characterisation between the different speakers. In the later dialogues the atmosphere of the after-dinner table is replaced by that of the lecture room, and Socrates discourses more or less uninterruptedly, the others merely making occasional interpolations in order to obtain fresh light on his meaning.

There is controversy as to the closeness of the resemblance between the Socrates who appears as the chief personage in the dialogues and the Socrates of actual historical fact. About the latter little is known, and it is at least possible that he was, as a teacher, less advanced than the leading character of the dialogues who, bearing but little relation to the original, may be conceived to have been used by Plato merely as the mouthpiece of his own views.

The course usually taken is somewhat as follows. In recounting some everyday event, somebody uses a term in common use such as "courage," "good," or "justice." Socrates asks him in what sense he is using the term, what, in fact, does it mean? Various suggested meanings are put forward, which Socrates has little difficulty in showing, by the dialectical methods for which he has become famous, to be unsatisfactory. Socrates is then challenged to produce his own definition of the term, and usually takes the rest of the dialogue to do it.

Discussion of "Justice"

The Republic follows these lines fairly closely, the term under discussion being "justice," which is used in a sense equivalent to social morality. But although the nature of justice is thus the *formal* subject of *The Republic*, the two main themes in the dialogue are the construction of Plato's ideal state and the exposition of his Theory of Ideas. The transition to these subjects is effected in the following way.

Two of Socrates' disciples, Glaucon and Adeimantus, brushing aside the arguments used by Socrates in the first book, make a forcible statement of what subsequently came to be known as the Social Contract Theory of the origin of society. This leads to a request to Socrates to provide them with an exposition, and, if possible, with a proof, of the superiority of justice to injustice in the light of the following considerations. (1) Before society there was no law or morality, and everybody preyed upon his neighbour, injustice being natural to man. This state of affairs proved intolerable. Men accordingly formed a contract to live in a society in which the performance of unjust conduct would be visited with penalties. As a result we are on the whole reasonably just in our conduct, but only because we are afraid of the law and public opinion. Hence nobody is just for the sake of justice. Men behave decently merely because they desire to avoid the social consequences of being unjust. (2) Strip justice of its rewards and injustice of its penalties, then go a step farther and visit the just man with the penalties of injustice and the reputation of being unjust into the bargain, and who would wish to be just? (3) In actual fact it is true that men do prefer justice, but only because society has taken care to ensure the performance of those actions, known as socially useful actions, which benefit it, by rewarding those who do them.

Sanction and Basis of Morality

Morality (they affirmed) is merely the name that society gives to the kind of conduct that suits it. By maxims of the "honesty is the best policy" and "play for your side" type, it assures the individual of public consideration and esteem, if he does what it wants and obeys its ordinances; and so the just man prospers. Nor is it in this life only that the just man receives his reward. Even the gods can be "squared," and a little judicious piety now will guarantee an eternity of bliss hereafter. Hence the appeal of religion, like that of morality, is not to man's goodness, but to his far-sighted self-esteem. It promotes the kind of conduct which is likely to bring a man most benefit in the long run.

It is clear that Glaucon and Adeimantus are here impugning the whole structure of social and individual ethics. What, they ask, is the sanction and basis of morality? Are morals merely conventional, as they can so easily be shown to be, or do they represent any innate preference on the part of men for the good over the bad irrespective of their consequences? The answer of Socrates to the problem put

by Glaucon consists in pointing out that society is a natural, not an artificial, growth. There was no pre-social contract period of society, because man, being by nature a political or social animal, is found at all times to have been living in society. Living in society, in fact, is as natural to man as breathing. It is not fair, therefore, to represent the ordinances of society and the social morality which they embody as being things unnatural or artificial, imposed in the teeth of man's *natural* anti-social proclivities.

If, therefore, society is a natural outgrowth of human nature, the principles operative in the latter should be operative also in the former, and, what is more, more clearly discernible in society than in the individual, since the social field is larger. Let us, then, says Socrates, first look for the principle of justice, not in the individual soul, but where it is writ large, in the state. He proceeds, therefore, to construct the best possible state, since in such a state justice will be most clearly evident. Thus the famous Republic of Plato takes its rise. *See* books II V of *The Republic*, which will amply repay careful study.

Classes in the State

Briefly, the state is, in effect, what we should call an aristocracy of wisdom and talent. The population is divided into three main classes, each with certain specific characteristics. These classes correspond to Plato's division of the soul of man into three parts. These are the rational, the spirited, and what Plato calls the desiring, the appetitive, part. Each part has its peculiar virtue ; it is the virtue of the rational part to plan, guide, and control a task in which it enlists the assistance of the spirited part—and the rôle of the desiring (or appetitive) part is to be in subjection to the rational.

Each aspect of the soul is represented by a particular type of individual, the type, namely, in which the aspect in question predominates. Consequently the three classes of the state are the guardian class, dominated by reason ; the military or soldier class, in which the spirited element of courage, with its associated virtues of zeal and loyalty, is pre-eminent ; and the mass of ordinary citizens, the workers, whose virtue consists in going about their business, in obeying the laws, and in generally acquiescing in the leadership of the first class. Justice in the state (or social and political virtue) is to be found in the principle that each class knows and contentedly performs its own job without interfering with the functions or seeking to usurp the rôles of the other classes. The guardians, in fact, should rule ; the soldiers protect and preserve ; and the workers carry on the ordinary day-to-day business of the state without meddling in politics. To produce human beings capable of the requisite political discipline is the object of Plato's system of education.

Education has two main branches, music—by which Plato means the humanities, the training of the soul and mind ; and gymnastics, or the training of the body. Its purpose is to mould the citizens to the principles upon which the state is founded and in accordance with which it is regulated. They must not only live in accordance with them but embrace and seek to preserve them with all the strength of a passionate loyalty. This will ensure the smooth running of the state, and will exclude the possibility of the desire for change.

Subsidiary features are a complete economic communism extending to the elimination of the private ownership of property, the holding of wives in common, and the education of children by the state. There is an official regulation of art, as a result of which only men whose wor is inspired by the austere principles of the stat are to be allowed to practise their art. Further features are the exclusion of lawyers , the limitation of the function of doctors to killing or curing ; and the prohibition of private fortunes.

The Good Life

The principle guiding Plato's state-building is that, just as reason should be the unquestioned master in the soul, so the class which embodies the reasoning faculty should be the governing class in the state. This class receives a special education in philosophy, which Plato regards as the knowledge of reality.

As the governing class is, by all the standards that Plato's philosophy can apply, the best, so his political creed resolves itself into a plea for specialisation of function in society. The best will rule, the duty of the rest being to submit themselves to the best. It is, in fact, the business of the rulers to frame regulations so that by the mere process of obeying them the citizens are constrained to live the good life or, rather, the best life of which they are capable.

The object of society in general is to make the good life possible for the individual ; the special virtue of Plato's society lies in the fact that it ensures that this good life shall, in fact, be lived by all its citizens. If it be objected that the great mass of the citizens—all, in fact, except the guardian class—are deprived of the exercise of self-government and must live the good lives of slaves rather than of free men, Plato's answer is that they attain to so much of the good life as their nature renders possible. Different good lives are appropriate to different classes of men, and the highest good life is appropriate only to the guardian class.

The democratic principle asserts, as against Plato, that only the wearer knows where the shoe pinches ; he who obeys the laws should on the whole be he who makes them.

LESSON 3

Plato's Theory of Ideas

ASKED in *The Republic* how his state can be brought into being, Socrates replies that it will be realized only when philosophers are kings. A philosopher is defined as one who knows reality. What, then, in Plato's view, is reality ?

The answer to this question is to be found in Plato's Theory of Ideas, one of the most famous theories in the history of philosophy. Plato was faced with two opposing positions in traditional Greek thought as to the nature of reality:

(1) That of Heracleitus (6th–5th cent. B.C.), which affirmed that everything is in a state of flux, and that therefore change alone is real.

(2) That of Parmenides (5th cent. B.C.), according to which change is an illusion and reality is changeless.

The view that everything is in a state of flux is fairly familiar, and it is not necessary to give the arguments for it at length. Physical science, for instance, shows that all material things are in a constant state of change. They tend to decay and waste away. Moreover, at every moment a thing occupies a different point in time, and must therefore possess different temporal characteristics ; for example, everything at every given moment is older than it was at the last moment. Nowhere in the material universe, nowhere in thought or consciousness, can be found anything that does not show this continual stream or flux of change.

Zeno's Arrow

The arguments for the view that change is an illusion are equally strong. Parmenides' expositions were chiefly directed to proving that reality as a whole cannot change. It is clear that nothing can become more than it is, except by the addition of something else ; but if one starts with literally everything, there is nothing left that can be added to it. Similarly, everything that is can only become less than itself by reason of some part of it becoming separated from it and departing somewhere else ; but once again, if one starts with everything that is, there is no place whither the separated part can proceed that has not already been comprehended in the whole reality with which you started. Similar arguments can be applied to demonstrate the impossibility of the growth or diminution of any *particular* element in the universe—that is to say, of changes in the quality as opposed to the quantity of everything that is. It follows that the whole cannot change, and that any apparent change in the parts is therefore an illusion.

Greek philosophers delighted to invent paradoxes to prove the unreality of change. Of these the most famous is that of Zeno, the Eleatic philosopher. Consider, he said, any apparent example of change or motion—an arrow, let us say, in its flight. At any given moment of its flight it either is where it is, or it is where it is not ; if it is where it is, it cannot be moving, since, if it were, it would not be there ; and it cannot be where it is not. Therefore at that particular moment it is not moving. Similar arguments apply to any other point or moment in the flight of the arrow ; therefore at no point or moment does it move ; therefore its movement as a whole is an illusion. The illustration of Achilles and the tortoise is an example of the same reasoning.

Contrary Qualities

The essence of Plato's Theory of Ideas consists of a combination of the two views just considered. What Plato did in effect was to accept both conceptions, the conception of change as fundamental and the conception of change as an illusion, but to limit their application. Heracleitus's arguments were, he thought, true of the world we know by means of our senses. In this world, that is to say, it is a fact that there is nothing which is not continuously changing. Moreover, no object can be asserted to possess certain qualities with any more truth than that it can also be asserted to possess the contrary qualities. A rabbit, for example, is small to an elephant, large to an ant, i.e. it is both small and large. Tepid water seems hot to a man emerging from a blizzard, cold to one emerging from a furnace, i.e. it is both hot and cold. As Plato puts it, sensible objects, i.e. those we know by means of the senses, fluctuate between the possession of qualities and the possession of the opposite qualities. No true judgments can, therefore, be passed about them, since they do not possess any definite fixed attributes to be the objects of these judgments.

The World of Becoming

Even while one is in the act of attributing a quality to a thing it is already changing in respect of that quality. Things *are* not, in short, anything at all, because they are always on the road to *becoming* something else. (The sensible world was, in fact, designated by Plato "the world of becoming.") Therefore they cannot be quite real ; therefore they cannot be the objects of certain definite knowledge, but of opinion only. Yet, as logic and mathematics show, there exists certain and definite knowledge. What, then, is it about ? Plato's answer is that it is about the world of Forms or Ideas.

The existence of a Form is indicated whenever

the same name is used to denote a common quality of a number of different objects—whenever, in short, objects can be grouped together as members of a class. Salt and snow are different objects, yet both are white ; hence it is necessary to think of a Form of whiteness, which is somehow manifested in both of them and because of their participation in which they possess the quality in virtue of which both are called white. Similarly, institutions and actions can both be regarded as just. Hence, there is a Form of justice which bestows upon them this common quality—which causes them, as it were, to exhibit such justice as they possess.

Reasons can be given for thinking that the entities denoted by these class names, which confer qualities such as whiteness upon sensible objects, and qualities such as justice upon institutions and actions, are :

(1) Not the same either as any one or as the sum total of the objects which are found to possess the quality. It is, for example, clear that to think about whiteness is a different experience from thinking about any particular white thing, or even about the sum total of all white things. The quality of whiteness is therefore not the same as any of the objects which exhibit it. Nevertheless, to think about whiteness is certainly to think about something, if only because thinking about whiteness is a different experience from thinking about blackness.

(2) Not ideas in the mind of the person thinking about them. It is fairly plain that if squareness, for example, were only an idea in the minds of human beings, the extinction of the last human being would alter the shape of a chess-board, or, rather, would result in its having no shape at all. Yet there is no reason to suppose that the extinction of a human mind involves an alteration in the shape of that which the human mind knows. All that it does involve is that the shape is no longer known. Unless one is prepared to say that all things that are known, including tables, chairs, and people, are ideas in the mind of the knower (and this is, in fact, the view of some philosophers, those who hold the tenets of Idealism), there seems no reason why the shape of squareness should be supposed to go out of existence, or to cease to characterise those things which are recognised as square, merely because they cease to be known. Plato concluded, therefore, that the Forms were contained neither in the objects which exhibited them nor in the minds that knew them ; they are non-mental, non-material entities which are real factors in the universe, different from individual material things and transcending them.

In geometrical conceptions there is a clue to Plato's Theory of Ideas. In a diagram a particular figure is seen, but this figure is merely a representation of the abstract idea.

The Real World

For Plato these entities constitute the real world, which is composed of immaterial forms such as whiteness, justice, goodness, circularity and so forth, which are changeless, perfect, eternal. Possessing such qualities as they possess completely and changelessly, they can, unlike the changing things known by means of the senses, be made the objects of fixed and certain knowledge ; they are, in fact, the proper study of the mathematician and the philosopher.

Being the perfect specimens of the types of which sensible objects are imperfect representatives, they may be conceived as the models to which sensible objects try to approximate. Hence, the world of sense is regarded as an imperfect copy, in a changing and distorting material medium, of the world of forms. A material thing owes such qualities and, therefore, such knowability as it possesses, to the imprint of the form upon the brute material of which it consists. It follows that the world of sensible objects is semi-real, being compounded of a blend of the world of reality which Plato calls being, and of the brute material which he thinks of as not-being. "It floats about," to use an expression of Plato's, "between being and not being."

This conception is illustrated by the famous analogies of the line and the cave which appear in *The Republic*. Plato asks us to conceive of a line divided into two and again subdivided into four parts. Briefly, the first half of the line represents the sensible world, and the second half the world of forms. These two worlds stand to one another in point of reality as the first division of the first half, that is to say, as images seen in water, stands to the second division, that is, to the sensible objects of which they are images. Controversy exists as to the objects of the first division of the second half, which are usually thought to be those which mathematics studies ; the last division of the second half stands for the world of forms.

The simile of the cave in Book VII further illustrates the relation of the world of forms to the sensible world. The analogy of the sun is invoked to exemplify the fact that the relationship is twofold. The sun is not only the cause of our seeing material objects ; it is the cause of their existence. Similarly, the forms are the cause, not only of sensible objects being known, but of their existing.

This simile leads Plato, at the end of Book VI, to ascribe a special place to the form of the Good. It stands at the head of the hierarchy of being, giving reality to the other forms, as

they do to the sensible world. There is, however, no further reference to this conception anywhere else in Plato, and it should not be pressed.

Theory of Forms

Three very brief illustrations of different types may serve to illustrate the sort of conception that Plato had in mind, and the reasons which led him to adopt it.

Suppose a potter takes a lump of clay and moulds it into a vase. What is it that he has changed ? Provisionally the ball of clay may be divided into form and matter– the matter is clay, the form that of a sphere ; at the end of the process the clay has the form of a vase. Now it is clear that the matter, the clay, remains constant throughout ; it has not, we will suppose, been either added to, or diminished, during the transformation. The matter, therefore, has not changed. Nor has the form, because the form of a sphere cannot become the form of a vase. The form of a sphere is, as Plato says, constant and immutable ; it can only be and remain itself. All one is entitled to say is that in a certain medium the form of a vase has replaced the form of a sphere ; the clay, in fact, which formerly manifested the form of sphericality now manifests the form of a vase.

Modern physics has taken the hard, tangible lumps of solid matter, the atoms of the 19th century, and so whittled them away that it is exceedingly difficult to say what is left. Matter to-day is infinitely tenuous and elusive: it is a hump in space-time; it is positive and negative charges of electricity; it is a " wave of probability undulating into nothingness." Nowhere is there anything stable, solid or constant to be the basis of the modern conception of matter. All that is left is a flux which is stripped of all qualities except that of change. This modern conception of matter approximates very closely to that of the featureless medium in which Plato conceived the forms to manifest themselves. The shapes and qualities of things, he would say, are due to the manifestation in the flux of modern matter of the forms, or, to put it in more scientific terms, to the nature of the unchanging laws which the material stuff of the universe obeys, these laws being themselves immaterial forms.

Aesthetic Appreciation

In one of his most famous dialogues, *The Symposium*, Plato applies the Theory of Ideas to the problem of aesthetic appreciation. Roughly his conclusion is that there is a form of beauty which manifests itself in great works of art, and which is the cause of the peculiarly exciting emotions that they arouse. The problem of aesthetics is very puzzling. If A says " these gooseberries are sweet," and B " they are sour," it is obvious that both A's judgment and B's judgment may be right, since each is making a statement, not about some quality possessed by the gooseberries, but about the reactions to the gooseberries of his own palate. It is the effect produced upon him which he describes as sweet or sour respectively. One man's judgment, in other words, is as good as another's.

But in art criticism and appreciation, it is felt that one man's judgment is not as good as another's ; that one man can have good taste while another has bad ; and even though jazz produces feelings of pleasure in more people than does Bach, or the latest thriller than does Shakespeare, some are not, therefore, prepared to agree that jazz is better music than Bach, or the latest thriller better literature than Shakespeare. This is recognition, in fact, that there is some objective standard in these matters, by reference to which the value of different works of art may be assessed, irrespective of the pleasure which they happen to give. It is precisely this objective standard that Plato's theory of a form of beauty, manifesting itself more or less fully in aesthetic objects, seeks to supply.

Subjects for Discussion

(1) Was society formed as the result of a contract (implied or expressed) made by men to live in society ?

(2) Do we only obey the laws and act rightly through fear of the consequences, if we disobey them ?

(3) If you could become invisible at will, would you deny yourself the satisfaction of your desires, because of moral considerations ?

(4) Is the rule of the best either (a) desired, or (b) desirable, since the best are not the most and do not represent the most ?

(5) What are the reasons for believing in the imperfect reality of the sensible world ?

(6) What are the reasons for believing in the existence of Forms ?

LESSON 4

The Philosophy of Aristotle

THROUGHOUT the Middle Ages Aristotle was the dominating influence in philosophy, and his works were regarded with the reverence appropriate to sacred writings. His ideas are, however, less capable of concise formulation than those of Plato ; they are more technical, and they tend to demand some prior acquaintance with philosophy for their comprehension. One or two essential doctrines in the Aristotelian philosophy must be included

here, not only because of their intrinsic importance, but because of their influence on subsequent thought.

Aristotle was a pupil of Plato, and in regard to most issues his philosophy takes its start from a criticism of the views of his predecessor. He was, in particular, critical of the doctrine of the Theory of Ideas. The mistake, he held, that Plato had made was to endow with separate existence the common qualities of individual things. Because a number of things had the common quality white, Plato had deduced that there must be a Form whiteness, over and above the white things. On the contrary, Aristotle maintained, there can be no kind of existence other than that belonging to individual things.

Aristotelian Analysis

As an alternative solution, he himself put forward the doctrine of Matter and Form, to which reference was made in the preceding Lesson. Consider, said Aristotle, any completely developed individual thing, either a natural thing such as a horse or an oak, or a manufactured thing such as a vase or a copper bowl. Now a horse or an oak is made of the same chemical constituents as a pig or an ash, but, owing to the fact that these constituents are arranged differently, the horse or the oak has a characteristic form or structure different from that of the pig or the ash.

Aristotle held, therefore, that each individual thing can be analysed into two constituents : first, the matter of which it is composed ; secondly, the law of organization or structure manifested in the matter, which accounts for its having the characteristics that it has, and for its difference from other related things. The first element he called Matter ; the form of organization or structure he called Form. Everything that exists exhibits these two elements, and there is a hierarchy or grading of things according to the degree to which they embody Form. Thus an oak is composed of the Matter "tree" and the Form "oak" ; a tree is composed of Matter "wood" and Form "tree" ; therefore tree, which is Matter to the oak, is Form to wood ; an oak, in fact, is a more differentiated individual thing than a tree.

Aristotle does not suggest that Form exists in independence of Matter ; Form is merely the way in which the matter is organized. The crudest form in which matter exists, its lowest degree of organization, is in the elements ; but even these are diffentiated from one another by their specific and appropriate forms of earth, air, water, etc. At the other end of the scale, God, and God alone, is conceived to be all Form and no Matter.

The doctrine of Matter and Form provides an answer to the question—what are the constituents into which any particular thing may be analysed ? A further and no less important question is—how does any particular thing come to be what it is ? The answer to this question is provided by Aristotle's doctrine of Potentiality and Actuality. Let us consider two originally indistinguishable germs- the germ of an oak, let us say, and the germ of an ash. It is not practically, even if it be conceivably, possible to distinguish one from the other. Nevertheless, it is a fact that one will grow into an oak and the other into an ash, and that neither has the capacity for becoming anything other than what it does in fact become.

Aristotle expresses this fact by saying that each germ is already *potentially* what in due course it will become *actually*. Thus, every growing thing possesses originally a potentiality to realize its appropriate structure or form. The process of growth is a process by which this potentiality becomes actualised. The form, to revert to the language of Aristotle's other conception, which is originally latent or potential, becomes actual.

Looking at the process from the other end, it may be said that the developed product is the actuality of which the initial material contained the potentiality. The process by which a potentiality becomes actualised is not a limitless process ; the realization of the appropriate form is its end. Thus every growing thing in nature may be regarded as seeking to achieve an end, and as being drawn forward by the end which it is seeking to realize from the beginning of its development. The application of this doctrine is not confined to natural growths. If, for example, an architect proposes to build a house, the house is potential in his initial plan or idea, and the actual process of construction is merely the making actual what already existed potentially.

God and the Universe

Combining the doctrines of "Matter and Form" and "Potentiality and Actuality," Aristotle believes himself to be in a position to give the first complete account of the causes of the present world order—or, in other words, the first complete answer to the question, "What is the reason why the world contains what it does and appears as it does?" This answer is contained in the doctrine of the "Four Causes." If, says Aristotle, you want to know why a thing has become what it is, there are four factors to be taken into consideration.

First, there is the Matter of which the thing consists—the germ from which the oak has grown. This is called the *material cause*.

Secondly, there is the Law in accordance with which it has developed. The germ, in other words, has a tendency—which it cannot escape

—to grow in the manner appropriate to oaks, not in that appropriate to ash-trees. This tendency or "Law" of development is called the *formal cause*.

Thirdly, there is the agent whose initial impulse sets the whole process going. There must, in other words, be a parent oak that produced the germ which is seen to be the material cause ; the agent is called by Aristotle the *efficient cause*.

Fourthly, there is the result of the whole process—the End or actualised Form which the developing germ may be said to be seeking to realize—the oak from the acorn, or the completed picture from the artist's inspiration. This is called the *final cause*. The Greek word for final cause is "telos," and all doctrines which, like Aristotle's, emphasise the end or purpose which a developing thing may be seeking to realize as a determining factor and motive force in its growth are called teleological doctrines.

Mechanism and Teleology

It is important to distinguish the teleological causation, as it is called, from mechanistic causation. The latter insists that a thing is determined and caused from behind—in other words, that a complete account of its present nature could be given in terms of the factors from which it has derived, and that a knowledge of these factors would enable us to predict it. This is the kind of causation appropriate to the workings of a machine, every movement of which is completely determined by the totality of factors constituting its preceding state.

Teleological causation insists that in addition to these factors, account must be taken of that which the thing is trying to become. One can think, for example, of his conception of the end of the race as determining the movements of the runner who seeks to win it ; of his idea of the completed picture as prompting the efforts of the artist who seeks to paint it. The full nature of a thing is not realized until it reaches its final or completed condition ; and every growing and developing thing is animated by a desire fully to realize its nature. In this sense the nature of a thing may be regarded as a goal, already preformed, inspiring and determining the process of a thing's development towards the goal. While not ignoring the part played by mechanistic causation, the whole tendency of Aristotle's philosophy is to emphasise the teleological aspect of growth. His philosophy is essentially purposive ; it describes things in terms of the end they are seeking to evolve.

Conception of God

This tendency is exemplified by Aristotle's conception of the Deity.

The question may be asked : "How and why does the process of development described by the doctrine of Potentiality and Actuality take place ? What is the initial motive force of the whole process ?" Aristotle's answer is—the desire of the world for God. God is conceived neither as creative nor as supervisory. He is not responsible for the world, nor does He interfere with it. He is perfect, aloof, and detached, dimly sensed by the world, and, because of His perfection, loved as well as sensed. Just as the particular good I desire and conceive moves my desire and determines my efforts to secure it, so God moves the desire of the world and determines its development towards Him. He is conceived as a magnet, drawing the world ; and the motion which the world's desire for Him engenders is the cause of the whole cosmic process whereby Form develops in Matter from Potentiality to Actuality.

Aristotle and Christian Theology

Aristotle's conception of God was ultimately worked into the structure of Christian theology. Admittedly, it is a far cry from a God untroubled by the affairs of a world to which He is related only as the remote object of its aspiration, to the Christian God Who is concerned with the welfare of sparrows and the lilies of the field. Nevertheless, the Scholastic philosophers of the Middle Ages effected a fusion of the two conceptions.

For example, Aristotle's God is not creative ; nevertheless it is the desire of the world for Him which is the cause of the world process of growth and development. This process, as we have seen, consists in the continual actualisation of Forms which were previously latent or potential. Hence, it is due to the influence of God, even though He does not consciously exercise any influence, that things develop as they do and become what they are.

In this sense, then, the world is dependent upon God for being what it is, and God may, therefore, be regarded as, to this extent and in this sense, creative. By a number of subtly ingenious arguments, Aristotle's theism was fitted into the theology of early Christianity, and, for the Scholastic philosophers, Aristotle became a kind of second Bible.

Problem of Pain and Evil

Apart from the uses to which it was put by early Christian philosophers, Aristotle's conception of the Deity has certain obvious advantages. The great—the apparently insoluble—problem of the ordinary theological conception of a creative God is the problem of pain and evil. If God existed before the world, and if God is all good, there was initially neither pain nor evil. Therefore God either willed them to come into existence, or He did not. If He did, He is not benevolent ; if not, they exist in His despite and He is not omnipotent.

If it be said that pain and evil are willed not

by God but by man, upon whom God has had the goodness to bestow the gift of Free Will, we are faced by the problem raised by the fact of God's omniscience. God, if omniscient, must have known the use which man would make of his Free Will to do evil and to inflict pain. He must have known, therefore, that the gift of Free Will to men would result in the introduction of pain and evil into a world which knew them not. The concept of man's Free Will, therefore, does not enable God to evade the responsibility for the pain and evil of the world.

There are various ways of meeting these difficulties, but in the opinion of many none is satisfactory, the problem of pain and evil being frankly regarded by many theologians as a mystery which man cannot, in the present state of his knowledge, aspire to solve. Aristotle's conception of the Deity does not involve this problem, since, as Aristotle's God did not create the world, He is not responsible for its imperfections. God, for Aristotle, is the changeless source of value, perfect and aloof, not contaminated by interest in or responsibility for the imperfect and the changing.

The following topics in this and the immediately preceding Lessons may be considered :

Do the Forms of objects exist independently of things, or are they in some sense bound up with them ? If so, what is their relation to the Matter in which they appear ? Can a thing be determined both mechanistically and teleologically ?

LESSON 5

Medieval Philosophy

It is not unusual for an age to belittle its predecessor. True to type, the scholars, architects, and fashionable society of the Renaissance belittled as uncouth the Gothic styles and philosophies of the Middle Age , these terms in themselves convey ridicule and are misnomers, for the 13th-century craftsmen have little in common with the barbarian invaders of the Dark Ages and the term " Middle Age " was never used by writers of that time. From Rabelais down to Locke, and even into the 18th century, the medievalists were decried as musty obscurantists who did not understand " nature " and only filled a gap between the world of Greece and Rome and that of the Classical Revival in the late 15th and early 16th centuries.

Only when the new age had besmirched nature with the hideous factories and industrial conditions and with the bitter national and religious wars which sprang from modern ideas and inventions, did Horace Walpole strive after the Gothic in Strawberry Hill, while Goethe had a vision of the Middle Age in the stone and " Stimmung " (tune) of Strasbourg Cathedral.

In the Middle Age the philosopher was almost inevitably a priest, for the priests were the schoolmasters and their calling provided the only way to learning, except for the rich or particularly lucky men. Hence the medieval philosophers are often spoken of as Schoolmen and their philosophy as Scholasticism.

Augustine (354 430)

This saint was Bishop of Hippo in North Africa, and had nothing to do with his namesake the first Archbishop of Canterbury in England. Augustine of Hippo is important as one who handed on to the Middle Ages what remained of the knowledge of Greek philosophy— it was little because the barbarians had done their destroying thoroughly. As the Middle Ages did not start until some five hundred years after Augustine's death, and during these intervening years he had no worthy disciple, the legacy was inconsiderable. However, Augustine passed on various theories, mostly of a neo-Platonic origin, and a philosophy, mixed with religion, which sought " to see the truth of contingent beings in the Divine light." He believed that truth impressed itself on mankind like a seal which leaves its imprint in the wax. In this way Augustine came to find the world beautiful, clothed with goodness and light. His doctrines, especially on the nature of God and the Spirituality of the Soul, had great effect on the scholastics to come. In theology, he reaffirmed and developed St. Paul's teachings, and his influence on the theology of the West is second only to St. Paul's in importance.

John the Scot

Born in Ireland some time during the 9th century, Johannes Scotus Erigena, as he is sometimes called, lived on the eve of the Middle Ages and of that Scholastic philosophy for which he is in great measure responsible.

Though never conquered by Rome, Ireland had connexions with the classical world, particularly after the foundation of the Church by St. Patrick. The Irish were great travellers : they spread the faith far and wide, especially along the Rhine and on both sides of Lake Constance (where they founded monasteries on Reichenau and at St. Gall) ; they had missions, too, at Bobbio in the north of Italy. Thus foreign students came to make the long journey to Ireland—there are the graves of " Seven

Romans" on Aran in the far west—to study in a pleasant country at numerous monasteries where born teachers were abundant. Cashel, Clonmacnoise, and Monasterboice remain, in ruins, to show how far ahead of Western Europe Ireland was in art and learning at this time.

So it was not strange that John the Scot knew Greek : he inherited his Greek philosophy from both pagan and Christian sources. Probably he is more akin to the 5th century than to medieval times in thought, but his lively power of expression made a deep impression on the early schoolmen. In his theories about the essence of God he is largely neo-Platonic ; from Plato, too, comes his theory that God's will and intellect are an indivisible substance identical with goodness.

However, John is fervently Christian. He saw in man's return to God a transfiguration whose value far exceeded any suppression of individuality. To him, the soul spiritualised the body, which, however, remained body, as air remains air when illuminated by light and molten metal is still metal after passing through the fire.

As all humanity returns to God, there is no place for Hell in John's conception. For this and for his general "newness," he was rejected by the Church. The schoolmen decided that neo-Platonism was insufficient and turned for a Christian solution of their problems to the more realistic philosophy of Aristotle.

Arabian and Jewish Philosophers

The non-Christian Arabs of the 12th century were more cultured than the Crusaders, whom they regarded generally as heavy northern heretics. The Saracens had better table manners, were more skilled in architecture, astrology, and mathematics, and knew much more about Greek philosophy than their contemporaries in Western Europe. As a result of the Crusades, especially after the loss of Egypt and Spain, the Christian world made no conquests but learnt the value of damask (Damascus), satin (Zaitun), steel from Moorish Toledo, and leather from Moorish Cordova, and it brought back a new knowledge of medicine, algebra, and Aristotle. For the Arabs had learnt Greek philosophy from looted manuscripts and Christian slaves. Also they had knowledge from native sources ; a school of philosophy through which spread the teachings of both Aristotle and Hippocrates, the father of medicine (5th—4th cent. B.C.), had been founded at Edessa in the 4th century. For centuries, too, the Arabs were more or less friendly neighbours of the Eastern Empire before they went to war and conquered it.

Of the Arabs, Ibn Roshd (1126 98) of Cordova, usually known as Averroes, is probably the most important. He was a notable commentator—Dante praised him as such—whose mysticism drew a great deal from Plato and something from the Hindu idea of Nirvana and from the Persian religion of Zoroaster. Averroes saw in God the source of all Intelligences, of which human intellect is the last and purest. The mystical union of the soul with God he regarded as the end of life.

Judaism also played its part. Greek influence was powerful in Palestine at the time of Christ ; later it increased. When the Moors conquered Spain, they tolerated the Jews ; Jewish philosophers, scientists, and literary men flourished. Of the philosophers, Avicebron (1050) and Maimonides (1135-1204) are the most important. The latter attempted to give a philosophical justification, on an Aristotelian basis, to Jewish doctrines. Hence his importance in the advent of scholasticism. So paradoxically, as it were, Aristotle and realism came through the pagan Arabs as balm in an age when thought in Western Europe was largely theological and entirely Christian.

13th Century

During this period Europe gained peace and prosperity, mainly from a development in centralisation and unity at the expense of regionalist and separatist elements. It is, of course, quite erroneous to look on the Middle Ages as a period of bellicose anarchy. At no other time has Western Europe been more united and peaceful, for we must regard baronial squabbles as the rough sport of a rougher age. Except for the Crusades and the Spanish struggles to eject the Moors, which were religious wars between Europeans and foreigners, the Continent was free from national wars until the English invasion of France ; by that time the period of the Middle Ages, properly so called, was drawing to a close. Pope and Emperor had some control over Western Christendom at any rate outside the British Isles.

It has already been shown, earlier in this Lesson, that the Crusades brought into Europe new learning and commodities from the East. The capture of Constantinople by the Crusaders in 1204 delivered enormous spoil to Venice. Not the Turks, it is interesting to note, were the losers, but the Greek Emperors whom the Crusades had set out to aid. The city of the lagoons was henceforward the main link between East and West. Plagues were few, life grew more comfortable, and the monastic schools ripened with age. Universities grew, and provided scholars. In them were generally the new mendicant orders of friars, most of them eager and even good teachers. Finally, Greek books from Constantinople helped to introduce that knowledge of Greek philosophy which was already being gleaned from Arab and Jewish sources. The age of scholasticism was at hand.

Albertus Magnus (*c.* 1205–80)

Perhaps due credit is not always given to this philosopher's genius, paradoxically enough because he was the teacher of Aquinas. But though the pupil was undoubtedly more brilliant than his master, to Albertus must be given the praise due to a great teacher whose influence was tremendous at the universities of Cologne and Paris.

St. Thomas Aquinas

The most brilliant of scholastic philosophers was born about 1227 of a Neapolitan noble house, educated at the rich and aristocratic monastery of Monte Cassino, near Naples, and had the Emperor as cousin. He chose to join the Dominican order of friars, with their traditions of poverty and active thinking and teaching. When his family kidnapped him, he refused to change his ways and roughly handled an "Eve" they sent to tempt him from his ways. His fame was already established when he began to work for his doctorate in Paris at the age of twenty-five. It grew when, with his friend the Franciscan St. Bonaventura, he successfully justified the friars against the secular clergy before a papal court. In 1263 he paid a short visit to London, to attend a general chapter of his order; he probably lodged near the site of the office of *The Times*. He spent the latter part of his life (he died in 1274) in Italy, where he compiled the *Summa Theologica*, a compendium of all human religious knowledge.

At the outset of a study of the most "subtle" of scholastic philosophies, one point in particular should be grasped. The great Greek philosophers, like most intelligent Greeks of the 5th century B.C., had little serious regard for the gods of Olympus, deities of a far more primitive age who ruled only in the hearts of ignorant countryfolk.

Thirteenth-century Europe, on the other hand, was permeated with a deep sense of Christian faith, coming from a Church whose influence spread over all branches of learning, professional knowledge, and administration, and was the unique source of religion. So it is only natural that Thomas Aquinas should stress the importance of theology, while not diminishing that of philosophy. His Aristotelianism is visible in his recognition of the intellectual appreciation of God; to him, the intellect discovers God and prompts man's will to follow it to knowledge, which is his gate to wisdom. But, partly no doubt to meet the views and objections of non-Christians, Aquinas stressed the superiority of faith to reason a trend all the more important because his own genius lay precisely in a lucid and rationalist presentation, worthy of a brilliant, legal mind.

Aquinas envisaged reason and faith as having for their end a knowledge of God and his wisdom; but reason starts from "sense data," while faith rests on revelation and authority. Each needs to study the knowledge arrived at by the other. This cannot damage either of them, for they cannot be contradictory, since both reason and faith come from God, the one and absolute source of truth. Aquinas found faith the more important of the two, since it bestows a reason which man could not otherwise possess; here, revelation becomes important, as understood by Christian, but scarcely by pre-Christian, philosophers.

Aquinas and Aristotle

Aristotelianism suited the theory of Aquinas because Aristotle was much more scientific and rational than Plato, whose "World of Ideas and God" had well suited the early Christian mystics. There was, too, a freedom in Aristotle from the dangers of pantheism, which had tainted the neo-Platonists and a good deal of Levantine thought in the two centuries after Christ. It should always be remembered that Christianity started at a meeting-place between East and West, that Greek rather than Latin was the medium of intellectual thought in Palestine and Syria, and at Alexandria, where were the greatest library and university in the world. Pantheism and dualism were dangers to be still watched and scotched in the time of Aquinas.

Aquinas's systematic methods were all the more successful because combined with simplicity of expression. Professor de Wolff (*History of Mediaeval Philosophy*) compares the scholasticism of Aquinas with the "cathedrals of the beginning of the thirteenth century, which also strive to attain power in logic and soberness." And if Aristotelianism, blended to suit the Christian palate, was the basis of Aquinas's philosophy, he gained much of his knowledge of Aristotle through St. Augustine and the Arabs. From Augustine, Plato, and, above all, from Christ, came his idealist inspirations. Finally, to the genius of Aquinas himself is due that brilliant synthesis which swept through the universities of Paris and Oxford.

Duns Scotus

Like John the Scot, Duns Scotus has no recorded birthplace; also the year of his birth is uncertain (*c.* 1265). But it seems likely that he was born at the little town of Duns, between Edinburgh and the Border, and died in 1308. He was a Franciscan, one of a more radical and emotional order than the Dominicans to which Aquinas and Albertus Magnus belonged. As a native of this country and a lecturer at Oxford, his importance in English intellectual thought at the time was great—particularly since to Oxford came young men not only from the neighbourhood but from all parts of Britain and even from the Continent. Scotus earned the

title of subtle ; he was anything but a dunce, though over-elaborate Scotists a century later may have deserved the tag for their often ridiculous preciosities.

In many ways Scotus is like Aquinas, more so than his differences with the latter might lead us to imagine. Both men were friars ; in the Catholic Church, this fact means that they have much in common, especially if set against their successors, the very different philosophers of the 19th century. It often seems as though Scotus was attempting to score points by his elaborate exploitation of any breach he could make in the defences of Thomism.

The Champion of Will

Aquinas had been perhaps too much of an intellectualist ; that is to say, he did not allow enough scope for will to suit the Voluntarist theories of the Scotists. From the promise that humanity will recognize the infinity of God, Duns Scotus goes on to suggest that God's will is the ultimate test of virtue. The Christian God, unlike the Hellenistic deity, is not only the storehouse but the source of ideas ; not only is He goodness but its very source. There is no limit, then, to God's will, though He will avoid contradictions and preserve unchanged laws once decreed. The Scotists thus became great protagonists of the universality of being—real distinctions between essence and existence disappear, as they do between the soul and its faculties ; all divine attributes are fundamentally one.

Yet because Scotus is the champion of will, he becomes also that of the individual. This is perhaps one reason for the popularity of his voluntarism, in preference to the intellectualism of Aquinas. It would not be fair to suggest that Aquinas would have disagreed with his rival's theory, but Duns Scotus did lay more stress on the individual and considered that his originality would exist even when he achieved final perfection.

Duns Scotus has had a powerful following in the Catholic Church, but his influence upon philosophy can scarcely be compared with that of Aquinas.

William of Occam

The spirit of destructive criticism, which has been remarked already in Duns Scotus, grew marked in the 14th century. The pure constructive work of the 13th century was over ; in its place were found over-elaborate Decorated architecture and precious wrangling on philosophical trivialities. Undergraduate Oxford was already discussing problems for problems' sake, and Occam (*c.* 1295-1349) was a typically " clever " young don.

Arbitrary Divine Power

The scholastics had been mainly inductive in their method. Scientific discoveries were to lead to deduction. Oxford's interest in science had developed immensely since the versatile Roger Bacon (1214? 1294), philosopher and physicist. So it came about that Occam applied mathematical methods to problems of theology and philosophy. He taught that the only substances are individual things and their properties : the universal exists only in the soul (thought) of the Unacknowledgeable person. More thoroughly than Scotus, Occam applied moral laws to the pure and simple will of God. Like Descartes later, Occam might have said that had God wished, He could have made it meritorious for man to hate Him. Scotus had put a restriction on any change in the first two commandments : Professor Gilson (*Philosophy in the Middle Ages*) suggests that, according to Occam, adultery and theft could be considered virtues if God so willed, and that He only recompenses virtue and punishes vice because He so wishes Once the universal archetypes and essence are removed, there is no barrier to arbitrary divine power. Gone was the middle way between faith and reason which Duns Scotus had counselled. Nominalism had returned and the first triumphs of pristine science had appeared in the 14th century, " in the very womb of the philosophical school of which William of Occam is the chief representative " (Gilson).

Occam's Razor

Indeed, even though Occam stresses the omnipotence of the divine will, he seems to throw doubt on any proof of the existence of God and His attributes. Championing the Empire against the papacy, he concludes his work of ill-reasoned destruction by helping politically, as well as through his writings, to bring down the fabric of scholasticism. New discoveries of scientists, printing and gunpowder, together with the rebirth of classicism, were soon to bring the Middle Ages to an end. The famous dictum called Occam's Razor (do not multiply things or facts beyond what is necessary) led to a severity of thought and criticism which is startlingly modern.

LESSON 6

Descartes, Spinoza, and Leibnitz

The philosophical significance of the word Rationalism is very different from its use in ordinary language. Philosophical Rationalists are those who believe that truth about the universe can be arrived at by the exercise of reasoning without reference to observation. If the facts observed, e.g. by scientists, conflict with the conclusions at which reasoning has arrived, they tend to be dismissed as illusory or at best as semi-real. Hence Rationalism, which normally issues in some kind of Idealist philosophy, tends to make a distinction between appearance and reality, "appearance" being the world as it appears to our senses, "reality" being the world as revealed to the reasoning faculty employed in philosophical speculation and analysis.

Since the reality arrived at by the reasoning faculty of philosophers is more ordered, more unified, and more satisfying emotionally than the world of which our senses make us aware, and has usually included, and sometimes been identified with, a deity spiritually conceived, Rationalism in philosophy tends to issue in beliefs which are diametrically opposed to those commonly advocated by the rationalists and secularists engaged in anti-religious propaganda.

A Priori Knowledge

The belief that the nature of the universe can be discovered by reasoning, independently of observation, rests upon and presupposes the existence of knowledge which persons possess initially or have acquired otherwise than through their senses. Such knowledge is called *a priori.*

Let us consider, for example, the case of inference. The knowledge involved in the making of inferences—as, for example, when, having seen a man enter a room containing one door and no window, and, having carefully watched the door and failed to observe him coming out, we infer that *therefore* he is still in the room—appears to be *a priori.* Inferential knowledge is incapable of being proved, because the validity of inference would have to be assumed in any process of proof we proposed to undertake. All reasoning processes—e.g. whenever we say that one thing follows from another—involve inference, and to deny inference is to deny the validity of reasoning. Yet it is only by reasoning that the validity of inference could be established. If the validity of inference cannot be proved, the fact that we not only infer but infer correctly seems to show that our knowledge of inference is given *a priori.*

To take another example, one comes to know in the first place that two and two make four by taking instances of pairs of objects, putting them together, counting them, and finding that they make four objects. It is then realized that the truth discovered applies not only to the objects counted, but to other objects; that the truth that two and two make four holds, in fact, universally of all objects, and would remain a truth even if there were no objects to count. Since this truth is true in respect of objects not experienced by us, it follows that our knowledge of the truth cannot be derived entirely from experience. Experience was no doubt necessary in the first instance to draw our attention to the truth; but, once noticed, the truth was seen to be independent of the experience which illustrated it. Hence, though all knowledge may begin with experience, it does not all spring from it. It is this knowledge which does not spring from experience that is called *a priori.*

Descartes' Method of Doubt

If, then, there is *a priori* knowledge, as the Rationalists have maintained, it will follow that many things knowable are not provable. That they are self-evident to the intellect will be a sufficient guarantee of their truth. Hence Descartes (1596-1650), the father of modern philosophy, lays down the axiom that whatever the intellect clearly and distinctly conceives is true. Setting himself to doubt whatever could be doubted (the "eternal challenge" of philosophy), he finally arrived at one fact which, it seemed to him, was indubitable; this was the fact that he was doubting. To doubt is to think, and to think implies that one is a self-conscious, reflective being. Hence, Descartes arrives at the proposition which is the basis of his philosophy: "I think, therefore I am."

This proposition carries with it two important consequences: (1) There is an ego, or I, who doubts; hence there is an ego, or I, who is conscious. The ego who is conscious at one moment is the same as the ego who is conscious at the next. Hence, there is a continuing self which is other than the psychological states which occur in and to it, and which joins these states together, much as beads are threaded on a string. The conclusion leads to the belief in a self which does not passively receive experience, but is active and to some extent determines what experiences it shall have. (2) The mind knows its own states with more readiness and certainty than it knows the objects of its states—the emotion felt at seeing a ghost, more certainly than the ghost. This suggestion rapidly leads to the conclusion that the mind knows only its mental states.

The Mind-Body Problem

Descartes, without himself drawing this conclusion, was led to maintain a sharp distinction between mind and what was not mind. He conceived the world, in other words, as a dualism of mind and matter, and the human being as a dualism of mind and body. The problem of the relation of mind and body which is thus raised by Descartes is one of the most difficult in philosophy. It is also the fundamental problem of psychology. Briefly, the problem may be stated as follows : mind and body are continually interacting in an infinite number of ways - indeed, they influence each other at every moment of our waking life. If I am drunk, I see two lamp-posts instead of one ; if I fail to digest my supper, I have a nightmare and see blue devils ; if I smoke opium or inhale nitrous oxide gas, I shall see rosy-coloured visions and pass into a state of beatitude. These are instances of the influence of the body upon the mind. If I see a ghost, my hair will stand on end ; if I am moved to anger, my face will become red ; if I receive a sudden shock, I shall go pale. These are instances of the influence of the mind upon the body.

The examples just quoted are only extreme and rather obvious cases of what is going on all the time Many thinkers, indeed, assert that mind and body are so intimately associated that there can be no event in the one which does not produce some corresponding event in the other, although the corresponding event which is called the effect of the first event--may be too small to be noticed. The interaction between mind and body is, at any rate, a fact beyond dispute. Yet reflection upon the manner of this interaction makes clear the difficulty raised by the occurrence. Mind, it is clear, must be something which is immaterial ; if it were material, it would be part of the body. The contents of, or the events which happen in, the mind --that is to say, wishes, desires, thoughts, aspirations, hopes, and acts of will are also immaterial. The body, on the other hand, is matter, and possesses the usual qualities of matter--shape, size, weight, density, inertia, occupancy of space, etc.

Now, there is no difficulty in understanding how one material thing can be influenced by another. Each possesses the same attributes of size, shape, and weight, in virtue of which each can, as it were, communicate with or get at the other. Thus, a paving-stone can crush an egg because the egg belongs to the same order of being as the stone. But how can the paving-stone crush a wish, or be affected by a thought ? Material force and mass have no power over ideas ; ideas do not exert force, nor do they yield to mass. How, in short, can that which has neither size, weight, nor shape, which cannot be seen, heard, or touched, and which does not occupy space, come into contact with that which has these properties ?

Thus, what has to be reconciled is the fact of apparent continuous mind-body interaction with the apparent impossibility of understanding how such interaction could possibly take place.

Spinoza

Born in 1632 at Amsterdam to a family of exiled Portuguese Jews, Spinoza had from early days an outlook born of widely different traditions. His parents were crypto-Jews, that is to say, Jews whom the Inquisition had compelled to become Christian, though they somewhat naturally remained mainly Hebrew in outlook and, in this case, had reverted to their old religion on arrival in Holland. This curious religious background accounts partly for Spinoza's subtle understanding of both Judaism and Christianity. Exiled from the synagogue at the age of twenty for his heretical theories -- he was already an admirer of Descartes—and allowing a greedy step-sister to have the fairly comfortable family estate after winning a law-suit against her, Spinoza lived in poverty as a grinder of optical lenses. He died in 1677 from tuberculosis brought on by the glass dust his work drove to his lungs, comparatively young and after a simple life He has been acclaimed as the founder of modern metaphysics, moral philosophy, and higher criticism.

Spinoza believed that the Universe was One and that this One was a single whole, an entity which is God. Insistence on the universality of God permeated all his philosophy and caused the young German Romanticist, Novalis, to speak of him as "ein Gottbetrunkener Mensch" (a man drunk with God) Yet Spinoza was considered by many to be a blasphemer, in so far that he seemed in a way to deny free will and the immortality of the soul, and taught that all things, whether good or evil in the eyes of men, were of God. Actually he was insistent on the identification of nature and all her works with God and denied final causes in nature alone : time has shown his brilliant monism in a truer perspective.

Spinoza raised nature to God : he could not conceive that the Deity should create the world out of caprice or in a haphazard way, all of a sudden, out of nothing. As God is all and all is God, Spinoza is a pantheist ; hence his appeal to the enthusiastic nature-loving Romanticists of a later age. There is much of the seriousness of his own century, however, in his works. To him the Bible was God's word—though to be treated as a literature critical of man's life rather than as a dogma to be blindly accepted. Christ was His mouthpiece, sent to teach not only the Jews but all mankind.

Christ and the Scriptures are wisdom and virtue. Christianity, too, teaches humility ;

and man's greatness, according to Spinoza, lies in his power to criticise life and despise himself. Just as the Bible aims at securing peace, goodwill, and mercy, Spinoza sees in these the hopes for that toleration through lack of which his own century and his own parents had suffered.

Thus he is a pioneer of liberal ideas. Yet he has been called Machiavellian because he seems to suggest that might means right. Actually his theory is much the same as that of Hobbes, who felt that man should "render unto Caesar" in order to prevent life from being necessarily "nasty, brutish and short," as it would be without the existence of society and the state. But he would have his Caesar govern according to the Will of God and so raise his state from the level of the law of nature to that of the law of reason. Thus man would secure happiness in a true knowledge and love of the universe; and, to Spinoza, knowledge is life. Meantime, while he is still in an imperfect state, Spinoza urged that man should not "upbraid God for having given him an infirm constitution or a feeble spirit." As absurdly "might a circle complain that God had not endowed it with the properties of a sphere, or an infant, tormented with stone, that God had not given him a healthy body."

Seeking to explain truth by a coherent theory, Spinoza turned to mathematics and adopted a geometrical method complete with definitions, axioms, propositions, proofs, and corollaries. In fact, says C. E. M. Joad, he "believed with Descartes and Leibnitz that the universe was sufficiently like mathematics for the truth about it to be attainable by the process of *a priori* reasoning from premises which were taken to be self-evident." He has been criticised because of the insufficient self-evidence of his axioms and definitions, which often seem to presuppose the very conclusion he is setting out to prove: *a priori* methods alone are inadequate.

The Cartesian View of Mind-Body Interaction

Descartes was the first philosopher seriously to tackle the problem of mind-body interaction. He propounded the following solution: God, he held, had created two substances, mind and matter. These proceeded, as it were, on two parallel lines which never intersected. God in His benevolence, in order that life in a material universe might be possible for us, had so arranged things that every event in the mind is accompanied by a corresponding event in the body. The fact that a man's hair stands on end (bodily event) when he sees a ghost (mental event), or that he overflows with good will (mental event) when he has had too much to drink (bodily event), does not imply, as might be expected, a causal connexion between mind and body. The conjunction of these events is a coincidence brought about by the benevolent intervention of God. The metaphor frequently used in this connexion—it was, in fact, a metaphor of Descartes' successor, Leibnitz (1646–1716)—was that of two perfectly synchronised clocks.

The tick of each clock would inevitably be accompanied by the tick of the other, but this complete correspondence would not mean that the ticking of the one clock was *the cause* of the ticking of the other. It would mean that the clocks had been wound and set together. The conception inevitably involves the need for a winder and setter. Hence God was invoked to account for the fact that mind and body work together; it is God (or His system) who ensures that every event in the one will be accompanied by a corresponding event in the other. The influence of God is thus continually operative in the world; it manifests itself at every moment of our waking lives. On these lines Descartes, having radically separated mind and body, invokes the assistance of God to bring them together again.

This theory of the relationship of mind and body (whether or not God is invoked to harmonise them) is known as psycho-physical parallelism.

Leibnitz

Accepting from Descartes the notion of the impossibility of interaction between mind and matter, if they are radically different, Leibnitz denies the difference by virtually eliminating matter. The universe is composed, for him, of an infinite number of independent, spiritual units called monads. No monad can interact with any other monad; hence its experience is limited to events happening in and to itself. Leibnitz accordingly describes the monads as "windowless," to indicate that each monad remains shut up within the world of its own experience. The monads do not, on this assumption, know each other. The term monad is defined as an ultimate spiritual unit or atom—ultimate in the sense in which an atom of matter is ultimate.

Nevertheless there is a pre-established harmony in the universe, a divine system, whereby any event in one monad is accompanied by a corresponding event in all the others. Hence each monad may be said to mirror or reflect the universe, since all the events in the universe have their counterpart in it.

Now, the happenings in ourselves of which we are directly aware are mental events—a stream of thoughts, feelings, volitions, and so forth. What, then, is matter? Matter is an illusion, due to the monad's confused way of perceiving the world. The monads, that is to say, vary in grades of development, and mirror the world with varying degrees of clearness. The human being is made up of many different monads,

including one, the central, guiding monad of the highest development, which is the mind or soul. This mind or soul obtains a reasonably clear view of the world, or part of the world, but one that is still falsified by its conception of matter as apparently real. Only to God, the supreme monad, is the world completely revealed, under the guise of what Leibnitz's philosophy proves to be its real nature, that is, as a collection of monads.

Here, then, the distinction between the illusory world as it appears and the world as it really is is introduced for the first time in Idealism. This distinction later becomes very important, and it may be as well at this stage to say something of its purpose and of the reasons which have led to it.

Appearance and Reality

The world which is known by means of our senses—the world of everyday life—reveals, as Plato showed (*see* Lesson 3, page 997), very serious contradictions when we seek to understand it. In particular, no certain statements can, Plato held, be made about it, since it is continuously in a state of flux or "becoming." For this reason it fails to satisfy the intellect, which demands something that can be made the object of certain and definite knowledge. Reality, as conceived by Plato, the world of Forms, satisfied this demand. Again, the world we know is antagonistic to our purposes, thwarts our desires and outrages our sensibilities. There is therefore a strong temperamental incentive to hold that this is not the world as it really is—that reality, in short, is different from the world that appears, different and also preferable—more friendly, spiritual, amenable to our wishes.

It is perhaps for this reason that all those philosophies which have made a distinction between Appearance and Reality have tended to conceive of the world of Reality as being at once more satisfactory and more satisfying than the world of Appearance. For Hegel (1770–1831) Reality is a universal structure of thought; for Berkeley (1685–1753), the mind of a personal God; for Leibnitz it is—or at least it embodies—an underlying harmony. All these conceptions are exposed more or less directly to the charge of being rationalisations of human wishes. It is easy by philosophical methods to prove the non-reality of what one dislikes, but the Reality which one substitutes in its stead savours of what the Freudians call wish-fulfilment. Leibnitz's conception of the pre-established harmony introduced into the world by the Creator, in order that the monads might carry on intercourse with each other, involved the conclusion that everything that happens in the world, since it conforms to the harmony, happens in the long run in the best possible way. All, in fact, is for the best in the best of all possible worlds. This view was effectively ridiculed in Voltaire's *Candide*. The hero of that remarkable book passes through a series of appalling adventures, involving murder, battle, shipwreck, ruin, rape, and torture. Upon each incident as it occurs a Leibnitzian philosopher, Dr. Pangloss, is moved to dilate at length, showing how whatever happens, happens, in spite of all evidence to the contrary, for the best, and could not have happened otherwise. Comment seems superfluous.

The view that there are two distinct things in the Universe (usually conceived as mind and matter), neither of which can be reduced to the other, is known as Dualism. Dualists, therefore, deny that the Universe is a complete unity.

LESSON 7

Locke, Berkeley, and Hume

TRADITIONALLY opposed to the Rationalistic philosophers, Descartes and Leibnitz, are the Empiricists, Locke, Berkeley, and Hume. The common starting-point of these three philosophers is a thorough-going criticism of Rationalism. Denying the existence of *a priori* knowledge, they affirm that we cannot by reasoning alone arrive at the truth about the universe. Reasoning may tell us what ought to be, but it cannot inform us of what is. Therefore if we want to know what the universe *is*, we must leave the study and go and look; in other words, we must adopt the methods of science. Our knowledge is, they hold, founded on experience that comes through the five senses; we have *no* knowledge other than that provided by the raw material of sense experience.

The philosophy of Locke (1632–1704) begins with a criticism of innate ideas, these being the tools or weapons with which the Rationalists conceived mind to have been fitted initially, and by the exercise of which it obtained *a priori* knowledge, independently of experience. Locke in his philosophical writings sought to show that such ideas did not exist.

Similarly, Berkeley argues against abstract or general ideas. What is it, he asks, that is before the mind when we think of something abstract and general, like triangle? Plato's answer was the Form of a triangle, and most philosophers have invoked the existence of some kind of general concept or universal idea to explain abstract thinking. This course was not, however, open to Berkeley, since as general

ideas are not experienced by the sense organs. it would have involved the admission that something not experienced is known. Hence. Berkeley argues, thinking of a triangle brings to mind a specific triangle.

Representationalism

Believing all knowledge to consist of sense experience, the Empiricists were led to consider in detail the nature and analysis of such experience as it comes to us in knowledge of the outside world. Locke's philosophy is, in fact, a sort of psychology. The following is a brief summary of his view of the nature of perception, a view known as Representationalism. The external world consists of entities possessing only primary qualities, such as size, shape, number, and occupancy of space. These entities, impinging upon our senses. cause representations or images of themselves to appear in consciousness. It is these representations, called by Locke ideas, and not the external objects that cause them, that the mind knows. But the ideas, unlike the external objects, are invested by mind with secondary qualities such as temperature and colour, which the mind then projects outside itself into the world of objects The mind is thus conceived after the model of a dark cabinet containing a brightly lit screen illuminated by the light of consciousness What is known are not objects external to ourselves, but the images of them which are cast by the senses upon the screen of consciousness.

The following quotation from Professor Whitehead's *Science and the Modern World* admirably sums up Locke's view :

> Thus the bodies are perceived as with qualities which in reality do not belong to them, qualities which in fact are purely the offspring of the mind. Thus nature gets credit which should in truth be reserved for ourselves the rose for its scent , the nightingale for his song , and the sun for his radiance. The poets are entirely mistaken They should address their lyrics to themselves, and should turn them into odes of self-congratulation on the excellency of the human mind. Nature is a dull affair, soundless, sceneless, colourless , merely the hurrying of material, endlessly, meaninglessly

What, according to Locke, there really is in the external is a kind of featureless stuff called substance, which, though itself without qualities, serves as a substratum or foundation for the primary qualities.

Denial of Abstract Ideas

Berkeley abolished the distinction between primary qualities and secondary ones. Whatever reasons there were for believing that the latter were ideas in the mind applied, he held, also to the former. Secondly, and consequentially, he abolished the external world of things, which, though itself unknown to mind, was supposed by Locke to be the cause of the ideas which mind knows. But, if man does not, and never can, know the external world directly, he cannot, said Berkeley, know anything about it ; he cannot, therefore, know that it has the property of being able to cause the ideas he does know ; and he cannot know that it exists. Putting the point in another way, as man never has any sense experience of the external world, but only experiences his own ideas, he can only know the external world *a priori*. But *a priori* knowledge for the Empiricist does not exist.

This consideration applies also to Locke's substance, which *ex hypothesi* cannot be known, since it is devoid of qualities by virtue of which alone things can be known. Hence, for Berkeley to say of a thing that it exists is the same as to say that it is known, since whatever is known turns out to be an idea in the mind of the knower. Thus the existence of things consists in their being perceived or known. Berkeley's conclusions and the reasons for them will be considered in greater detail later.

Hume's Scepticism

Hume (1711 76) proceeds still farther along the same lines Berkeley held that the world continues to exist when we are not perceiving it, because it is perceived by God, who puts the ideas man experiences into his mind. But, as Hume pointed out, man has no sense of experience of God, and therefore, if he is consistent in his rejection of *a priori* knowledge, he cannot invoke His existence to sustain the world when he is not perceiving it. Therefore there is no reason to believe in the existence of anything other than the ideas we momentarily perceive.

Secondly, man has no experience of a self in and to which the ideas occur. If he tries to perceive the self, all that he meets are separate psychological states, e.g. a willing, a fearing, a hoping, or, in the case in question, an endeavouring to see whether he can perceive a self. It is these psychological states that he actually meets ; what he never comes across is a continuing thread to hold them together ; they remain, therefore, distinct isolated entities, a necklace of beads without the thread. Thus Hume reduces subjective Idealism, the position of Locke and Berkeley, to the position known as Solipsism, that is to say, the view that the isolated momentary experiences of the perceiver are the only things that are known to exist in the universe. In fact, they constitute the universe, while it must be remembered that, in the light of Hume's criticism of the self, even " the perceiver " is only invoked by courtesy. Much subsequent philosophy consists of different attempts to refute this conclusion. It may be said here that, although it cannot as yet be refuted, there is no reason to believe it to be true.

Bishop Berkeley

The philosophy of Idealism is something of a stumbling-block to those who are making their first acquaintance with the subject. The

doctrine has had a chequered history and, as put forward by Berkeley, it won little acceptance at the time. Pope has a line, "And coxcombs vanquish Berkeley with a grin." His views have been "laughed at, written at, taught at, shrieked at." Berkeley considered himself first a Churchman, second an Irishman, and only third a philosopher.

Every student of philosophy must know from his own experience that there is a stage of mental development in which Idealism appears to be the most monstrous of absurdities. Some will remember having heard at school the quaint notion that the world exists only in our minds or in some Higher Mind than ours ; and probably, after the fashion of schoolboys, we characterised this notion as "rot." Whatever it is, it is not "rot," and whatever our conclusions may finally be, let us remember the advice of Lord Acton—"to understand what we reject as thoroughly as what we accept."

Idealism and Matter

When we say that Berkeley denied the existence of matter—or, as he would now have to say, physical energy—we do not mean that he denied, or acted as if he denied, the existence of appearances. The difference between him and his opponents is that, while they postulate something behind appearances, Berkeley says this is superfluous. He finds no need to suppose that there is an inaccessible substance underneath all the properties by which a thing in the outside world is known. Those properties are themselves the whole thing. Subject to the qualification to be mentioned below, there is for Berkeley nothing beyond the world of sense, *but*—a world of sense.

What men commonly do, however, is to group together in their minds certain of the properties or qualities from which the external world is inferred, and then declare that these inhere in something which they agree to call matter—or, nowadays, energy. According to Berkeley, this matter is a creation of our minds, and has no existence outside them. It is our minds that have put together these qualities and properties, compared them, and then explained them in terms of something behind. But there is no such something behind ; to suppose that there is, is a delusion born of our way of thinking. As Berkeley points out, once the existence of such a something is admitted, all sorts of difficulties arise. The farther it is pursued the more certainly appear absurdities and contradictions ; but, says Berkeley :

"Upon the whole, I am inclined to think that the far greater part, if not all, the difficulties which have hitherto amused philosophers and blocked up the way to knowledge are entirely owing to themselves—that we have first raised a dust, and then complain that we cannot see."

Berkeley's Doctrine

Here is the famous passage in which, especially in its last sentence, his theory is stated :

> That neither our thoughts, nor passions, nor the ideas formed by our imagination, exist without the mind is what everybody will allow ; and to me it is no less evident that the various sensations or ideas imprinted on the sense, however blended or combined together, cannot exist otherwise than in a mind perceiving them. . . The table I write on, I say, exists—i.e. I see it, and feel it—and if I were out of my study I should say it existed, meaning thereby that if I was in my study I might perceive it or that some other spirit actually *does* perceive it. As to what is said about the existence of unthinking things without any relation to their being perceived, that is to me perfectly unintelligible. Their *esse* is *percipi*, nor is it possible they should have any existence out of the minds or thinking things which perceive them.

If nothing is perceived but individual ideas and sensations, it is impossible to imagine that any one of these ideas, or any combination of them, should exist *unperceived*. Their *esse* is *percipi*—their being is the being perceived. Furthermore :

> When we do our utmost to conceive the existence of external bodies, we are all the while only contemplating our own ideas.

Followed out in its logical entirety, this theory leads Berkeley to the famous passage :

> In a word, all the choir of heaven and furniture of earth—all those bodies which compose the mighty frame of the world—have not any subsistence without a mind ; their *esse* is to be perceived or known, and consequently, so long as they are not actually perceived by me, or do not exist in my mind, or that of any other created spirit, they must either have no existence at all, or else subsist *in the mind of some eternal spirit*.

Significance of God to Berkeley

It is sometimes asked: "Does the room in which people are sitting alone go out of existence when they leave it and therefore cease to perceive it ?" The implication of the question is that since, on Berkeley's view, the room consists entirely of ideas in the mind of the perceiver, when it ceases to be perceived there ceases to be a room. The implication does not follow, because of the part played by God in Berkeley's scheme. Because God continues to perceive the room, it continues to exist. The difference between real things and imaginary ones for Berkeley is that real things are those perceived both by God and by us ; imaginary ones are perceived by us only. If it is asked how Berkeley knows that God exists, his answer is that we have a "notion" of God. Since this "notion" does not come to us through the senses, it is perilously like the *a priori* knowledge which Berkeley had denied. It is, however, clear that unless one is prepared to follow Berkeley in introducing God to give independent reality to a world whose existence, apart from knowledge, has been destroyed, there remains the position that the only things which exist are our mental states and our knowledge of them. His belief presupposes that man is in an intelligible and trustworthy universe.

The Problem of Perception

The philosophy of Berkeley is chiefly famous because it raises in an acute form what is known as the problem of perception. It is clear how the logical development of the philosophy of Locke, Berkeley, and Hume is Solipsism, or the view that the only things which can be known are the ideas in the mind of the knowing self.

Many people hold that, if we start from the Representationalism of Locke—holding that what is immediately known in perception are not bodies outside ourselves, but representations thrown by such bodies on the screen of consciousness—then the Solipsistic conclusion is inevitable. At the same time, it is difficult to see how this view of Locke's can be refuted.

For this reason the problem of perception has become one of the most important in philosophy, especially in modern philosophy, and much of modern philosophy is concerned to answer the question: "Exactly what is it that I am knowing when, as I say, I see my hand?"

LESSON 8

The Meaning of Existence

In the present Lesson it is proposed to consider from a purely common-sense point of view what reasons, if any, may be adduced in support of the conclusion that whatever exists, exists only in so far as it is known, and that the nature of existence is therefore to be an idea in some knowing mind

Let us suppose that I press my tongue against my teeth and ask the question: "What is it that I experience or am aware of?" At first sight the answer would appear to be: "I am aware of my teeth." But is this answer really correct? Is not what one really experiences a feeling in the tongue—a feeling caused by the contact between tongue and teeth, but a feeling, nevertheless, and, being a feeling, something that is mental? Suppose, now, that I press my fingers against the table, is what I experience the table? Again the obvious answer proves on examination to be incorrect. The immediate object of my experience, that of which I am aware, is a sensation in my fingers, a sensation of hardness, smoothness, and coolness.

Take a further example. If I stand two feet away from the fire, I experience heat, and say that the heat is a property of the fire. If, however, I move nearer to the fire, the heat increases in intensity, until it becomes pain. Now, the pain is clearly in me and not in the fire; since, then, the pain is only a more intense degree of the heat, the inference is that the heat also was a sensation of mine, and not a property of the fire. The leg of a cheese mite is so small that, except with the aid of a microscope, one cannot see it. Are we, then, to suppose that the cheese mite cannot see its own leg? This seems unlikely. We must infer, then, that the size of the cheese mite's leg varies according to the nature of the mind perceiving it—that the leg has one apparent size for the cheese mite and another for ourselves. But the leg cannot have two different sizes at the same time. Hence the size turns out to be a property of our seeing, and not of the object seen; it is, in other words, not an intrinsic quality of the object seen, but relative to and dependent upon the nature of the perceiver's mind.

Physicists' Account of Perception

By similar arguments it can be shown that all the qualities apparently possessed by material objects, in their own right, turn out on examination to be feelings or sensations or ideas on the part of the perceiver. This conclusion is reinforced by the scientific account of perception. What precisely is it that, according to the scientist, occurs when we see something? Taking first the case of visual sensations, we find that their causation is roughly described in the following terms: a physical object sends out rays of light, which, after travelling through the ether, impinge on the optical nerve: the resulting disturbance in the optical nerve is conveyed along neural cords to the brain, where it causes a further disturbance in the cerebral cortex. It is as a result of this disturbance in the cerebral cortex that we have the sensation of seeing the object; this, in fact, is the physical event which *constitutes* our seeing. Similarly with regard to hearing: a sound is a vibration in the atmosphere; this vibration impinges upon our ear-drums, the effect produced upon the ear-drums is conveyed by the nerves to the brain; here it causes a disturbance, as a result of which we become conscious, and our consciousness of the cerebral disturbance is called hearing the sound.

Touch Perception

Perception by touch makes the matter even plainer. Suppose that my finger is pressed against the desk. Ordinarily, one would say that there was contact between two material substances. Science, however, lends no countenance to this view. What happens, according to science, is that repulsion is developed between the atoms composing my finger and those composing the desk. The harder the desk is pressed, the stronger are the electrical forces which repel my finger. These electrical forces

set up in the nerve cells at the end of my finger a current which reaches my brain, as a result of which I experience the sensation of touching the desk. In fact, however, I am not aware of any object external to my body, and, if appropriate parts of my nervous system are suitably stimulated, I shall experience the same sensation of touching the desk, although there is no desk to touch. What is more, I can experience what appears to be a sensation of a pinprick in the non-existent finger of a hand which has been amputated, provided that the nerve terminals in my arm are suitably manipulated.

It is on these lines, and, it might well seem, only on these lines, that it becomes possible to explain the fact of differing perceptions of the same thing. If X sees a cornflower as blue and Y, who is colour-blind, sees it as green, it is very difficult to suppose that the cornflower is both green and blue at the same time. On the other hand, there seems no reason to affirm that it *really* is blue merely because it is blue to normal vision, and to deny that its appearance to the colour-blind man is its *real* appearance because the colour-blind man is in a minority. The plain implication seems to be that the difference between the apparent colours is due to a difference in the physiological machinery of the two perceivers. Moreover, if we take an overdose of santonin, we see everything yellow. Since it cannot be supposed to be the case that this alteration in our visual apparatus has produced a corresponding alteration in that which we see, we can only suppose that the yellowness is the result of a peculiar condition of our seeing. But if this is true of yellowness, there is no reason why it should not be true of all the colours which we believe ourselves to perceive in the outside world.

Qualities and Substance

Thus the apparent qualities of things are not possessed by them in their own right, but are effects produced in the mind or the brain of the person perceiving the thing. But if the qualities of a thing are mental, what is left in the outside world? We normally think of an object as consisting of a lump of featureless stuff to which certain qualities belong. It is Matter, to revert to Aristotle's phrase, and the qualities taken together constitute its Form. But let us suppose that you take an object, and one by one strip away all its qualities. What is left? Consider, for example, a chocolate. A chocolate is brown, soft, sticky, and sweet to the taste. Let us abstract these qualities one by one and consider what remains. What is it that had the qualities, but now has them no longer? It may be said, of course, that what is left is the chocolate minus its colour, consistency, and taste. But is this residue anything at all? If it is, it is only so in virtue of such qualities as may remain in it; if these qualities, too, were taken away, there would be literally nothing left. There is, that is to say, no substratum or foundation in which the qualities inhere which is itself without qualities and other than they. If, therefore, the qualities turn out to be ideas in the mind of the perceiver, and if there is no substance or material foundation besides the qualities, there is nothing left in the end except mind.

Matter, therefore, is an illusion. This is not to say that the tables and chairs which we know in everyday life do not exist; merely that they turn out on analysis to be ideas in the mind of the perceiver. Hence, as Berkeley said, their existence consists in their being perceived or known.

LESSON 9

Kant: Critical Philosophy and Moral Sense

One of the most important questions in philosophy is the fundamental, sceptical question: can man know anything at all, or, rather, can he know it as it really is? Hume's sceptical conclusions had made this question very acute. There is, it is obvious, no necessary reason why the human mind should be an instrument capable of discovering the truth about the universe. The human mind works in accordance with certain prescribed laws of logic, certain rules of reasoning. It holds, for example, that a thing cannot both be and not be at the same time. It holds that if a thing has a quality X, it cannot at the same time not have the quality X. It holds that, if p implies q, and q implies r, then p also implies r. These are laws of logic. There are also mathematical laws: that 3 and 2 make 5, that $a^2 - b^2 = (a + b)(a - b)$, that the sum of the three interior angles of a triangle is equal to two right angles.

Now, it is a fact that we believe that these laws apply to the universe outside us. The universe, we are accustomed to believe, is such that a tree cannot both be and not be a beech, and that any three things in it, if added to two things, will make five things. But, for all we know to the contrary, these laws may be laws about the workings of the mind, and not in any sense laws about the workings of the universe. It may be merely that our *minds* are constituted in such a way that they are bound to think that a tree cannot both be and not be a beech, that three and two must make five, and that every

cause must have an effect. How do we know that these laws of thought really apply to things? Unless we do know this, we have no guarantee that our knowledge will give us truth about reality. Clearly, then, an inquiry is necessary into the nature and capacities of knowledge, so necessary that, it may be said, all kinds of philosophising are premature until we have ascertained something about the instrument which we mean to employ. In what sense do we know anything and to what extent?

Kant's Critical Philosophy

To answer this question was the object of Immanuel Kant (1724 1804), and it is one of the most amazing facts in the history of thought that the answer should have waited for so long. It is because the work of Kant constitutes a criticism of men's thought and of the conditions of their thinking that it is generally described as the "critical philosophy."

A somewhat uncouth word has also been employed—and is, indeed, now found indispensable—in order to indicate the study with which Kant chiefly concerned himself This word is *epistemology*, from the Greek word *episteme* (knowledge). Just as biology, then, is the science of life, so epistemology is the science of knowledge It is the department of philosophy which concerns itself with the knowing process, the conditions, the limits, and the validity of all that we know or think we know.

Certainly something is known of the external world. Daily life demonstrates the fact. Men act on the assumption that an unsupported object will fall, and they are found to be right So far, so good. There is, at least, open to man some proximate, practical, working kind of truth. There may be more, but at any rate there is this empirical truth the word empirical meaning experimental or dependent upon experience. We know that under the present conditions of things the sun will rise to-morrow. That is an empirical truth, demonstrated to be true by experience. But we have still no guarantee that this empirical knowledge of ours is really knowledge about reality. May it not be merely knowledge of the conditions imposed upon reality by our own minds?

This, very briefly, was Kant's position. Our knowledge of the external world, he held, is limited and conditioned by the limit and conditions of our own minds; it is knowledge not of reality, but of appearances The reality which lies behind those appearances is and must remain unknown.

The two opposed words which Kant employed for appearance and reality were *phenomenon* and *noumenon*. Philosophically a phenomenon is an appearance or something that appears; and, whenever we use the word, we are to associate with it in our minds the idea of a something else which, though hidden from us and not apparent, is yet the reality, the self, or the thing-in-itself, lying behind the appearance or phenomenon.

The universe, then, is divided into two sorts of categories of things, the real or the noumenal and the apparent or the phenomenal. Our knowledge is only of what appears to us, and is, therefore, only phenomenal knowledge. It is not suggested that there is necessarily any opposition or contradiction between the real and the apparent. It is asserted merely that our knowledge of reality must always be inferential and can never be direct.

An analogy may serve to make the matter plainer. Let us suppose that I am born with a pair of blue spectacles permanently affixed to the bridge of my nose. Then everything that I shall see will appear blue. This will not be because things really are blue, but because their appearing to be blue is a condition of my seeing them at all—a condition which is imposed upon them by the peculiarities of my visual apparatus If everybody else is in the same predicament, mankind will take the same view as I do, namely that everything is blue, because blueness will be a universal attribute of things seen by human eyes.

Kantian Categories

In much the same way Kant held that the mind was fitted initially with a whole number of sets of mental spectacles, whose peculiarities it inevitably imposed upon everything that it knew These spectacles are known as the Kantian "categories" It is, he held, a condition of our knowing anything at all that it should be in space and time, of a certain quantity, exhibiting certain qualities, the effect of a preceding cause and the cause of some succeeding effect. But this is the case, not because space, time, quantity, quality, and causality belong to reality as it is, but because they are categories necessarily imposed by us upon reality as it appears. Of reality as it is, the noumenal world, we can have no knowledge, because in the very process of knowing it we transform it into the phenomenal world, the world as it appears, by the categorising activities of our own minds.

Kant's Theory of Moral Sense

Some account has been given of the distinction which Kant makes between the world of appearance, the phenomenal world, and the world of reality, the noumenal world. Briefly, we know, and can know, only the world of appearance, becase we construct it in the very act of knowing it by imposing the categories of the mind upon it. On the basis of this distinction, we are in a position to give Kant's answer to the question: what right have we to

suppose that the laws of thought necessarily apply to the behaviour of things? Kant's answer is that they must inevitably apply to the behaviour of the things *that we know*, because the things that we know are the products of the minds which know them. By the very fact of knowing the world we have put causality, identity, mathematical relations, and so on into it. Inevitably, therefore, it is found to conform to the mental requirements of logic and mathematics. It is for this reason that science is possible. Science is simply knowledge of the phenomenal world. Science deals with appearances, with what Kant called "co-existences and sequences between phenomena," and science, a product of the human mind, is, therefore, true of the phenomena, which are also products of the human mind. But science does not give us knowledge of reality, which, Kant held, is obtained primarily in moral experience

Intuitionism in Philosophy

The moral theory occupies a key position in the Kantian system of philosophy, because while our knowledge of the external world is, in Kant's views, phenomenal that is to say, is knowledge of appearance only--he conceives that when men will and act morally, they are in direct touch with reality. The moral self, Kant held, is truly real, and in experiencing it we establish a direct contact with reality.

Ethical philosophy is discussed later, but Kant's theory is included here because of the closeness of the connexion between his ethics and his philosophy. The theory illustrates a certain type of ethical theory of which it is an extreme example. The type of theory to which it belongs is called "intuitionist."

Many writers on ethics have held that actions possess in themselves some intrinsic quality in virtue of which they have ethical value. This quality is recognized as belonging to the action by a special faculty known as the moral sense or conscience. The verdicts of conscience are intuitional; that is to say, though they may be defended by, they are not based upon, reason. They are also final. The moral sense is thus arbiter over all that pertains to the moral sphere, just as the sense of sight is arbiter over what pertains to the visual sphere. Our eyes tell us what is beautiful, and the moral sense tells us what is right, and there is no appeal against either verdict. Now, Kant's theory is intuitionist in the sense that it holds that moral actions are those which proceed from a good will. The essence of the theory is a distinction made by Kant between man as a moral agent and man "from the point of view of anthropology."

"From the point of view of anthropology" man is a creature of tradition, environment, and training. Morality is the name which he gives to actions of which his society approves, and his own actions are determined by his desire to stand well with his society and by the fear of its disapproval. From this point of view, our opinions on morality are formed not by us, but for us. We get them ready-made, as we get our clothes and shoes from the social shop.

Aristotle's Doctrine of Self-Determinism

Not only our beliefs, but also our desires are, from this point of view, determined. There is a famous doctrine called self-determinism, bequeathed to us by Aristotle, which puts very clearly the reasons for this view. Aristotle is concerned with the question: why does a man come to have a good character? His answer is: because he has continually performed good acts. But he cannot continually perform good acts unless he is the sort of man whose nature it is to perform them; unless, that is, he has the character from which good acts necessarily spring This good character will, in its turn, proceed from and be formed by a preceding series of good acts. The actions such a man performs at any given moment spring from, and are conditioned by, his being the sort of person that he is at that moment; and, further, that he is the particular sort of person that he then is because of the impulses which he experiences and the tendencies which he exhibits.

The tendencies and impulses which were originally his, on the first occasion on which he acted, are those which really determined the whole subsequent tenor of his life. The tendencies and impulses which the individual possesses on the first occasion on which he acts lie outside his control. These tendencies and impulses, which we are accustomed to call hereditary, acting in conjunction with and reacting from the environment in which he finds himself, determine his future actions. By these actions his character is formed. But, since he is responsible neither for his heredity nor for his environment, it would appear that he is not accountable for the actions which these two factors jointly determine, or for the character which is formed by these actions

Kant's Conclusions on Morals

As corollary to the doctrine of self-determinism, we have the doctrine of man's servitude to his desires and impulses. Man, in this view, is determined not by external forces, but by his own temperament: "he did so-and-so because he was that sort of person." Exhibit a man's actions - as psycho-analysis succeeds in doing—as proceeding always from the reaction of his character to a given situation, represent his character at any given moment as the determined result of his past actions, and the chain of causality is complete. So far as ethics is concerned, *tout comprendre c'est tout pardonner* is the only maxim.

Kant admits the conclusions of this analysis, so far as they apply to man "from the point of view of anthropology." So far, he says, as men act according to inclination, do things because they like doing them, or avoid them because they dislike them, their actions are what he calls "heteronomous," governed by laws over which they have no control. It is often assumed that human actions are the result of the interaction of character and environment, and are not, therefore, to be praised or blamed, but *understood*. But in addition to these various likes and dislikes, preferences and prejudices, which can be shown to have been determined for us there is a further judgment —a moral judgment— which tells us not what we want to do, but what we ought to do. The interesting thing about this judgment is its unqualified character. Its commands are absolute. In the first place, it does not make its injunctions dependent upon the achievement of any end. It says simply, "you ought to behave in such and such a way." Secondly, it is absolute because the obligation which it enjoins is not in the least affected by the strength of our desire to act otherwise than in accordance with it. It does not say, "you ought to do x, if your temptation to do x is not too great"; it says, "you ought to do x, whatever your temptation to do anything else." And in saying that you ought to do x, it implies also that you are free to do it. Thus the claim of morality cuts right across the pull of inclination and desire. Considered purely from the point of view of psychology and anthropology, man is not free; in the moral sphere we act and judge as if we are free.

The ground for this claim that people should act from the dictates of duty, irrespective of their likes and dislikes, cannot be found in the phenomenal world, which yields only a basis for determinism. Therefore it must be looked for elsewhere. Kant's conclusion is that the moral self belongs to and derives from a world other than the phenomenal world, namely the *noumenal* world of real things. For this reason its claims are absolute and take no account of likes and dislikes, circumstances and temptations, which Kant regarded as phenomenal.

Kant's Moral Imperative

Kant called the obligation to act morally "The Categorical Imperative," because of this absolute command which it makes. To say that it is absolute does not mean that it will necessarily be obeyed. People may act usually, even always, as non-moral phenomenal beings. Nevertheless the claim is there, whether we like to recognize it or not, and it is called absolute because it is completely unaffected by circumstances. Kant, in fact, supplemented his doctrine of the moral will with a number of subsidiary considerations.

For example, he pointed out that right action does not demand explanation, justification, or incentive. If a person acts wrongly, there is always some special motive which makes him do so. He lies *because* he wishes to convince so-and-so, steals *in order to* become possessed of so-and-so. No incentive is, however, required for truth-telling or honest dealing. In so far as people tell the truth or act honestly — assuming that they ever do these things —they do them for their own sake.

Kant derived a number of subsidiary rules from his moral imperative. A famous one is the rule to "act only according to that maxim which you can at the same time will to be a universal law." If, that is to say, an action is such that everybody could perform the same action without conflict or self-contradiction, then it will be right. If a freedom of action which could not be extended universally were permitted, it would prove to be morally wrong.

LESSON 10

Hegel: Monistic Idealism

HEGEL's philosophy, like that of Kant, is exceedingly difficult, and the student is recommended not to study it intensively until he has a fairly general acquaintance with philosophical arguments and terms. A reading of Hegel (1770-1831) demands a knowledge of Kant's philosophy, on which that of Hegel is based. Hegel is by far the most philosophical of philosophers, just as Bach is the most musical of musicians and Spenser the most poetical of poets. This does not mean necessarily that he is the best of philosophers, but merely that his work exhibits in the highest degree the peculiar characteristics of philosophical reasoning, and, perhaps for that reason, has a special appeal for professional philosophers.

Hegel's Monism

Hegel maintains Kant's distinction between the world of appearance and that of reality, but he conceives the world of reality differently. For him it is not a number of unknown entities (Kant's noumena), but a single, unified structure of thought. If a palaeontologist discovers the thigh bone of an extinct creature—a mammoth, let us say—he is enabled to construct an outline sketch of the whole of the creature from the one bone. This is because the bone has a coherent

relation to the whole of the creature's structure. It possesses shapes and proportions and functions interrelated with the shapes and proportions and functions of the other bones of the organism. Thus, in virtue of its own characteristics, it determines, points forward to, and reflects, the characteristics of the other bones. Hegel conceived each fragment of the universe, whether thought or thing, on the model of the isolated bone. It had, as it were, hooks which grappled it on to the next fragment of reality, that was again linked to the next, so that the whole formed one coherent, unified structure. Reflecting sufficiently on any one part or aspect of reality, one is led by logical and inevitable stages to the whole, which is a unified structure of thought.

This structure of thought, besides constituting the world of reality, contains within itself the world of appearance also, which is to be regarded as a partially revealed aspect of it. Thus Hegel's philosophy is an extreme statement of the view known as Monism, because it affirms reality to be fundamentally *one* unified whole, the appearance of many different things being regarded as delusive. Since the unified whole with which reality is identified is also a structure of thought, Hegel's philosophy may be called Monistic Idealism. It was first expounded in his *Phenomenology of Mind* (1807).

Axiom of Internal Relations

Hegel's conclusions follow from two different lines of argument, the first dealing with the nature of things, the second with the nature of our thinking about things. The argument about the nature of things is sometimes called the axiom of internal relations, and is as follows

Seeking to obtain a complete understanding of any one thing shows that the endeavour involves a necessary reference to other things. This is because, taken by itself, a thing is not self-sufficient. Thus an egg is more oval than a ball, more brittle than leather, and shinier than rock, and, if kept too long, it will smell. Now all these facts about the egg involve the relations of the egg to some other object or set of objects, and the egg must have these relations in order that it may be the thing it is. Therefore the relations of the egg to other objects determine, at least in part, its nature, and partially constitute this nature. They are not, strictly, like hooks attached to the egg from outside, linking it to other things; they penetrate into its very being, making it what it is. But the relations also have other ends or terminals, namely, in the things to which the egg is related. Of these things, too, they will, by the same argument, form part of the nature or being. But if the relations are part both of the egg and of the objects to which the egg is related, the egg and these objects are not really distinct and separate, but form part of the same related structure. Therefore the apparent differences between things are illusory; taken in isolation, things are not understandable, because they are not self-sufficient; that is, they are not real.

Theory of Knowledge

Hegel's theory of knowledge—how, that is to say, the external world is known—is a special case of the doctrine of internal relations. The difficulties in regard to theory of knowledge which had been raised by Hegel's predecessors were, he held, due to the fact that the problem had been wrongly formulated. Philosophers had thought of the knowing mind and of the object known as two different things, and of knowledge as a relation which somehow brought them into contact. Conceiving them as initially separate, they had never satisfactorily been able to bring them together. Hegel insisted that knowledge was, initially, a unity containing two aspects—the knowing mind and the object known. Take as an instance the knowledge of the pen with which one is writing. Hegel said, in effect, "You don't start with a mind or with the pen which the mind knows. You start with an act of knowledge—knowledge of pen." Knowledge of pen is a unity within which, by a subsequent act of reflection, are distinguished the two sides or aspects "knowing mind" and "pen known." But the unity comes first. It is, so to speak, what is given. The distinction into elements or aspects is secondary and is made by mind for practical purposes. Thus both a mind and a pen are mental abstractions from a prior unity which contains them both. They do not exist in reality as separate isolated things.

The Dialectical Process

Another chain of argument seeks to show that any particular theory or point of view, if pressed to its logical conclusion, leads the mind into contradiction. The student of philosophy is always being confronted with arguments each of which seems irrefutable, but all of which cannot be true, since some of them, at least, contradict others. For example, there are arguments to show that change or motion is unreal. There are other arguments to show that change, and only change, can be real. Both sets of arguments appear to be irrefutable, but they cannot both be true. Again, as we have seen when considering Berkeley, a thing can be shown to be the sum of its qualities; but no substance can be found behind these qualities. Yet if the world were composed of qualities and only of qualities, we should be quite unable to account for the existence of things. Again, there are valid reasons for believing in free will; reasons equally valid for believing in determinism.

Both theories cannot be true, but each undoubtedly seems to contain some truth. If,

then, they could be assimilated in a wider theory, which embraced both the contradictory opposites, that wider theory would contain more truth than either taken in isolation. Thus, in its search for truth, the mind is driven forward to a wider view that underlies both the previous contradictory views. This wider view will be confronted with its opposite, and the mind will be driven to formulate something still more embracing. This process, known as the dialectical process, proceeds indefinitely, until a complete view of everything is reached or the whole truth about everything that is. To this there will be no contradictory. Moreover, since it is related to the whole about which it is the truth, it will, by the Axiom of Internal Relations, be continuous with and part of it. The whole will therefore be mental; it will be a structure of thought.

Contradictions of Time and Space

Hegel's philosophy travels many different roads, but all come to the same conclusion. He is continually pointing out the contradictions in the conceptions which the unreflecting mind takes of the outside world. Take, for instance, the concepts of time and space. As a fairly simple example, it can be shown that no period of time can elapse. Suppose, let us say, that we take the period of half an hour; now half that period must elapse before the whole of it. This leaves us with a quarter of an hour.

Half this quarter of an hour must elapse before the whole of it. This leaves us with seven and a half minutes. Half of the seven and a half minutes must elapse before the whole of it. In this way we continue to shorten indefinitely the period of time which has to elapse; but, however short the period remaining, it will still be true that half of it must elapse before the whole of it. Something must always happen, therefore, before any period of time can elapse; before this something happens, something else must first happen, and so on *ad infinitum*. Therefore no period of time can ever elapse.

Space, like time, is infinitely divisible, since however small a piece of space is taken it can always be halved. Space therefore consists of infinitely small pieces of space. But to add any number of infinitely small things together, none of which occupies any space, is not to produce space. The conclusion seems to be that time and space will not bear thinking about, because to think about them is to land oneself into hopeless contradictions.

The solution which the Hegelian philosophy offers to these difficulties is to say that they arise because the concepts they involve, e.g. time, space, matter, are only partial, and have been abstracted by the mind from the whole to which they belong and in which alone they have meaning. Take a heart or a lung from a body or a note out of a symphony, and the heart, the lung, and the note are, literally, different entities from what they were in the wholes to which they respectively belonged. Let it be assumed that they were found only in these wholes and never found outside them; then to consider them as they would be in isolation—that is, outside the wholes in which alone they have being—would be to falsify them.

In just the same way Hegel holds, in considering concepts such as time, space, and matter divorced from the whole of reality, that we are considering them as they, in fact are not, and therefore inevitably land ourselves in difficulties and contradictions. Restore them to their places as aspects of the all-embracing whole to which they belong and in which they are found, and the contradictions disappear.

The Absolute

Thus the process of philosophic reasoning leads forward to a fundamental, all-embracing thought-structure, within which all differences between things are overcome and all contradictions between theories reconciled. This fundamental reality is Hegel's Absolute. All views of the universe other than that taken by the Absolute of itself, being partial, i.e. not the whole truth, are infected with error. It is for this reason that they represent the universe as a collection of different things, and not as a unified structure of thought. The differences are, however, on a deeper analysis, shown to be unreal. Hegel's Absolute is a timeless structure of thought; it is all reality and the only reality. Everything which is, everything which can be thought, consists of different manifestations of the Absolute, which is, nevertheless, wholly present in each of its manifestations.

Nevertheless, what may be considered a common-sense view of truth differs from the Hegelian view. The bell called Big Ben strikes the hours at Westminster. To say "Big Ben will strike nine" is a truth; Big Ben proves it by striking nine. This truth consists in correspondence between the idea stated and the fact of the striking. The fact is isolated, i.e. understandable apart from its relations with other facts, in order that the statement may correspond with it. This isolation is what Hegel's philosophy denies.

LESSON 11

Pragmatism and Realism

Most philosophy since Hegel consists of a succession of reactions from the idealistic monism which has been briefly described. The wholesale reaction of the 20th century from the ways of thought of the 19th has also affected philosophy, with the result that the early years of the century witnessed the rise of a number of different philosophies each of which began by contesting the conclusions of Kant and Hegel. In the first place, the philosophy of pragmatism—a method of thought rather than a system of conclusions—threw doubt on the possibility of absolute truth and absolute knowledge, emphasised the efficacy of human will, and suggested that, in knowing, we make a universe to suit our purposes. Secondly, the philosophy of Bergson criticised the static implications of Hegel's Absolute, the notion, that is to say, that time is unreal and reality changeless, and developed a philosophy from the opposite premise that, literally, the only real thing in the universe is change. Thirdly, and most important of the three, the philosophy known as realism criticises the idealist notion that things which are known depend for their existence on the knowing mind, and asserts that knowledge plays no part in the creations of its objects.

Realism in its initial stages endeavoured to take a more common-sense view of the universe than the philosophies of Kant and Hegel. Its methods were simple where theirs were complex, empirical where theirs were *a priori*. Taking its problems one by one, it endeavoured to solve them piecemeal, being content with a series of isolated truths instead of seeking to reach the whole of truth ; prepared to study appearances and to abandon the effort to penetrate through to reality. Very soon it proceeded to deny that the distinction between reality and appearance was a real distinction.

Pragmatism

This is less a system than an instrument for destroying other systems. As formulated by William James, Professor Dewey, and Dr. Schiller, it has become the *enfant terrible* of philosophy, deriding the claims of philosophy to be absolutely true, and even denying the possibility of such a thing as absolute truth. Its leading doctrine is that what we mean by truth is "that which works," that a true belief is simply one that serves on the whole the purposes of the person who holds it ; this cuts at the root of our conviction of the existence of objective truth and the possibility of achieving it. At the same time, pragmatism is a philosophy peculiarly suited to the temper of the age. It embodies the scepticism, the fluidity of hypothesis, and the readiness to adopt provisional views and see how they work, of a generation which takes more kindly to the tentative and experimental conclusions of science than to the dogmatic certainties which religion asks us to take on trust. It is also sympathetic to the teachings of evolution, introducing, as it were, a kind of struggle for survival between competing claims to truth and suggesting that the one which seems, or indeed *is*, truest is the one which has the greatest survival value.

The basis of the doctrine is a certain kind of scepticism. Traditional theology has professed to be able to prove the fundamental doctrines of religion. Its opponents profess to be able to disprove them. It has subsequently appeared that they are capable neither of proof nor of disproof. William James (1842–1910) assumed that there was no evidence one way or the other for religion. Yet we must, he held, believe something, if only because we have to act.

James's conclusion is that, although there is no evidence in favour of religion, we may as well, nevertheless, believe it, if we find satisfaction in so doing. All belief, he is inclined to suggest, involves risk, since we cannot know any belief to be true. That being so, the test of the truth of a belief will not be conformity with fact, but ability to work—that is, to serve the purposes which led to the belief being entertained.

The Continuum

William James considers that previous philosophical theories are founded on a false theory of perception. Locke, Berkeley, and Hume thought the raw material of sensation was a number of distinct, isolated impressions between which the mind never perceived any connexion. James maintained that it was what he called a *continuum*, i.e., a general confused blur into which the perceiver's mind inserted stops and gaps, thus breaking and cutting it up into the world of separate objects we know. Thus the relations between things are actually given in experience no less than the things themselves ; what the mind does is to make them explicit. The instruments whereby the mind effects this cutting-up process are concepts, i.e., general ideas in the mind which vary according to the interests and training of the perceiver. Two men with different concepts make different cuts across the continuum of experience, and so perceive different worlds of objects. From this it seems to follow that the mind perceives, on

the whole and within limits, what the perceiver likes. Pragmatists do to some extent really hold this belief.

Theory of Truth

Pragmatism proceeds to inquire what it is that, on the whole, makes us think a particular belief true. The answer given is that we shall think it true if it serves our purpose to believe it to be so. We are familiar with the view that religion invents God because men find it necessary to believe in Him, and pragmatism goes on to point out that it is only in so far as it gives emotional satisfaction that any religious belief is entertained. Starting with the position that we think true that which furthers our purposes or gives emotional satisfaction, the pragmatist proceeds to affirm that serving our purposes, or "working" in practice, is the meaning of truth.

In this connexion he takes as an illustration the procedure of the scientist. Scientific theories first appear as hypotheses, which are entertained for just so long as they work, being abandoned when new evidence is discovered which convicts them of inadequacy. The hypothesis is then modified to embrace the new evidence; the modified hypothesis is found to work that is, to serve the purposes of the scientist better than the original one—and is therefore regarded as true for so long as it does so. Thus scientific theories and even scientific laws are not absolute truths, but are postulates; their truth is continually subjected to review and progressively established by successful tests.

Truth is, thus, provisional and man-made, not something fixed and absolute, but changing as the purposes served by the beliefs that purport to be true themselves change and alter. The more often action on the assumption that a belief is true is found to produce satisfactory results, the truer the belief becomes. Thus the test of the truth of a belief is not conformity with fact, but success in promoting achievement of desires.

Man the Measure of All Things

The pragmatist rejects the common-sense meaning of truth as correspondence with fact, partly because he denies the existence of external independent facts with which our beliefs could correspond. This denial springs direct from the conception of the *continuum*. If reality is conceived as a confused formless blur, from which the mind carves out objects to serve its purposes, it follows that fact, like truth, is a creation of the human intelligence, bearing upon it the imprint of the purposes the fact was created to serve. All knowing, according to pragmatism, is relative to doing. Hence knowing a fact involves acting in reference to the fact known; therefore to believe in a fact is to alter it. If the belief alters the fact in harmony with our wishes, then, according to the pragmatic theory of truth, the belief in the fact is true, and it follows that the fact asserted by the belief is real. If the belief alters the fact in some way which is not entirely satisfactory, the belief is abandoned and a modified belief is substituted for it. This modified belief will assert a fact of a somewhat different character, which will be more in harmony with the wishes which led us to entertain the belief. Consequently the substituted belief will be truer than the original one, and the modified fact which the belief asserts more real than the original fact. In this way our beliefs make the facts which they assert. Thus man is the measure of all things, of reality as well as of truth, the relativity both of fact and belief to our interests and purposes being the underlying thread which runs through the whole of the pragmatic philosophy.

Modern Realism

Realism, a comparatively modern movement in philosophy, assumes many different forms, between some of which there is little in common. All Realists, however, concur in rejecting the idealist view of reality as fundamentally mental in character, and the idealist analysis of the process of sense-perception. Most Realists begin, therefore, by addressing themselves to the problem of perception, with a view to refuting the conclusions of Berkeley and exhibiting the object of knowledge as independent of the knowing mind. Among Realists may be mentioned the British philosophers Bertrand Russell, G. E. Moore, S. Alexander, and J. Laird; the American philosophers Professors Holt, Perry, and Montagu; and the Austrian philosopher, Meinong.

Consideration will be given to two typical forms of Realism, the first of which results in a view of the world not widely dissimilar from that of common sense; the second, known as Neo-Realism, issues in conclusions remote from those of the ordinary man.

Common-sense Realism

It is an axiom with most Realists that in perception the knowing mind is brought into contact with and made aware of something other than itself. This proposition is regarded as self-evident.

For Meinong there are three elements involved in perception: (a) act of knowing, (b) object of the act, (c) content of the act. In any two perceptual experiences (a) is the same, being conceived as a bare activity devoid of features. Yet perceiving a table is obviously a different experience from perceiving a chair. That which makes the experiences different is a difference in the respective "contents" of the two acts, a table content in one case and a chair content in the other, and what makes the

contents different are the different objects upon which the acts are directed. But if (a) the act is to be stripped of all features, all the differences between perceptual experiences being referred to (c) the content, (a) tends to become mythological and most Realists prefer to eliminate it altogether. Accordingly we have theories which postulate only two elements in perception the act of perceiving (a) which is qualitatively different in any two perceptual experiences ; the object (b) on which it is directed.

Now, it is obvious that it cannot be said that (a) represents *the whole* of (b) to the mind exactly as (b) is, otherwise it would be impossible to explain how two people have different perceptions of the same object. To meet this difficulty it is necessary to emphasise the activity of the mind in perception. This activity is chiefly shown in two ways : the mind selects from the total situation presented to it, and goes out beyond that situation. Let us suppose, to take an example from Professor Dawes Hicks, that a botanist, an artist, and a colour-blind person are each looking at a red rose (R). In view of the differences between the interests of the first two, their attention will be directed to different aspects of what they see ; the botanist will notice aspect r1, and the artist aspect r2. The colour-blind man, owing to the peculiarities of his vision, will again see a different aspect of the whole R, which we will call r3. Now, although r1, r2, and r3 are all different, it cannot be supposed that they are therefore mental, or that they do not exist in reality as aspects of the whole R. All the aspects of the objects that different people see are in fact real and given in the actual situations, but different features of the situation are discriminated in or carved out of the given whole by different perceivers, because of the differences in their training and instincts and the consequent differences in what takes their attention.

In the second place, the mind obtains fragmentary data in actual perception which it pieces together to form objects. In looking at a table, all that the eye sees is a couple of legs, the edge of the table top, part of a shiny brown surface, and so forth. The table itself is not seen (as a whole). It is the mind which goes out beyond these isolated fragmentary bits of material and puts them together to make a table. Different people may piece their perceptual material together differently , also in the process of going out beyond what is given, the mind, which must of necessity make jumps, may fall into error.

Endeavours are made by Realists on these lines to account for the fact of differing perceptions; at the same time they maintain that what is perceived exists independently of the perceiver.

LESSON 12

Bertrand Russell and Neo-Realism

More effective perhaps as a refutation of Idealism than the kind of Realism described in the previous Lesson and assuming in recent years great importance in philosophy, is the movement known as Neo-Realism. The most numerous advocates of Neo-Realism are to be found in America, but the Neo-Realist position has been effectively stated in England by Bertrand Russell. In his early book *The Problems of Philosophy* (Home University Series) Russell was already pointing out that we have no direct knowledge in sense experience of what are called physical objects. The arguments which he brings forward in favour of this view may be briefly summarised as follow.

What is it precisely that is experienced when a table is perceived ? A shiny brown patch which is seen, a cold hard something which is felt, a sharp hard noise which is heard when the table is tapped, and so on. These entities – the shiny brown patch, the cold hard something, the rapping noise – are called sense data (sometimes *sensibilia*), "things given to the senses," and it is of these and not of tables and chairs that persons have direct experience (what Bertrand Russell calls "knowledge by acquaintance") when contact is made with the external world. That the sense datum is not the same as what is called a physical object can be seen from a simple instance. If I put a shilling a foot away from me and a florin three yards away, the shining elliptical patch which is what I see in the place where the shilling is, is larger than the shining elliptical patch I see in the place where the florin is. Yet the florin is larger than the shilling. Physical objects, not being known by acquaintance, are said by Russell, in the book referred to, to be "known by description." Our knowledge of them is based on inference and therefore involves a certain amount of *a priori* knowledge.

Sense Data and Physical Objects

The problem raised by the recognition of the fact that what is directly apprehended in sensory experience of the external world are not physical objects, but are sense data, raps of sound, patches of colour, smell data, touch data, and so forth, is an exceedingly difficult one. In some way, it is true, men do know physical objects, but it seems very difficult to suppose

that they know them directly by means of their senses. What, then, is the relation between the sense data experienced by means of our senses and the physical objects with which in some way they seem to be connected? If I hold up my finger and look at it, what I shall immediately apprehend is an oblong, pink shape. If I touch it, I shall feel something warm and firm. If I put it in my mouth when I am heated, I shall taste something salty. What, then, is the relation between the oblong, pink shape which is certainly not warm or firm or salty, between the warm, firm something which is certainly not pink, between the salty something which I taste, and my finger?

Various suggestions have been made. It is said, for example, that the sense datum is part of the surface of the physical object. But if the surface of the physical object would not normally be said to have changed, and attention is focused upon the sense datum actually apprehended, which, on this view, is alleged to be a part of the surface, then the datum perceptibly varies according to the position from which, and the conditions under which, the alleged part is regarded. If, for example, the alleged part is seen from a greater distance, that which is actually seen is different from the part seen from a smaller distance. It differs again, if looked at obliquely or if our eyes are affected by santonin, and, most noticeably of all, it is different when *touched*. If the whole surface of the physical object does not change, then no part of it can change; yet the datum does continuously change, as the position of observation is changed.

It seems clear, then, that the datum cannot be identical with any *part* of the surface. Again, it is said that the relation between the object and the datum is that the object causes the datum. But if the datum is always directly apprehended and never the object, none of the properties of the object can be known by direct experience. They can at best be inferred from our knowledge of the datum. It is thus not knowable that the object is able to cause the datum; in direct experience there is no proof that the object exists at all. It is for these and other reasons that many writers are inclined to deny that there are physical objects which belong to the external physical world.

Russell's Later Views

In later books, *Our Knowledge of the External World* and *An Outline of Philosophy*, Bertrand Russell dispenses with the physical object altogether. If, in experiencing the external world, men never do and never can meet with anything but sense data, what legitimate reason, he asks, is there for supposing that it contains anything but sense data? To postulate a physical object as a hypothetical cause for the sense data, the cause being something which is never known, is like reintroducing Locke's unknown and unknowable substance to be the *cause* of our ideas and impressions.

But, if the external world consists of sense data, why do we believe in physical objects? Because of our correlation, in virtue of their resemblance to each other and in accordance with the laws of perspective, of numbers of sense data which are then regarded as being those caused by or associated with a particular physical object.

Sense data are not enduring entities, but have only a momentary existence. Moreover, they are affected by physiological, though not by psychological, conditions in ourselves. The sense datum, however, though affected by the nervous system and brain, is not affected by the mind, nor is it part of the mind. It is an entity independent of mind and known by mind exactly as it is. Thus Idealism forms no part of the view of perception.

Universals

If the activity of the mind in perceiving is to be limited to bare awareness—if, in fact, the mind knows sense data just as they are, differences between people's perceptions being explained in terms of differences between the sense data perceived—there seems to be no good ground for attributing to mind a different sort of activity in knowledge. Hence some Realists believe in the independent reality of objects known as universals. When one thinks of justice, the mind, on this view, is in direct contact with a non-mental entity called sometimes a "universal," sometimes a "subsistent object," the relation of the mind to this object being one of direct awareness. A theory of thinking and, in particular, of the part played by the mind in thinking, has been worked out in America by Professor Montagu and others on this basis.

LESSON 13

Sense and Perception

THE following arguments are mainly taken from C. D. Broad's *The Mind and Its Place in Nature*.

(1) If I am looking at a bell, nobody would maintain that what I see is, or is identical with, the whole of the surface of the bell. For example, the bell has an inside as well as an outside; yet what I see is a coloured patch of indefinite boundaries, which, although it may be part of the outside, is certainly not part of

the inside. Therefore what I see is not identical with the whole surface of the physical object called a bell.

(2) The bell, considered as a physical object, is extended not only in space but in time; it has a past and a future, and the length of its history from the time of casting to that of demolition is in theory measurable. What I see is a single, comparatively short, contemporary event. It may be true that the short contemporary event which is the object of my seeing is also a contemporary slice of the history of the bell, which extends backward into the past and forward into the future, but it is certainly not identical with it.

(3) A bell is more than a coloured surface, and the surface itself has qualities other than that of colour; it is, for example, also hard and cold. What I see when I look at the bell has colour, but is neither hard nor cold. So what I see is not identical with the surface of the bell.

(4) What I touch when I touch the bell is both hard and cold, but is not coloured. The surface of the bell is coloured. Therefore what I touch is not identical with the surface of the bell. It is also different from what I see when, as I say, I look at the bell. The conclusion is that neither in visual nor in tactile experience is what I directly apprehend by means of my senses the *whole* surface of the bell.

(5) I can be the victim of what are commonly called hallucinations. A hallucination is a state of mind in which I believe myself to see things which would in common parlance be said not to be there. A similar state of mind attends intoxication; the drunkard sees what he calls pink rats in circumstances in which no person who is not drunk sees them, and in which consequently there would be agreement between all sober persons that the pink rats were not there.

Accepting this argument at its face value, assuming, that is to say, that the drunkard's experience is delusive, in the sense that there are really no pink rats there, then we are justified in saying that, whatever it is that the drunkard perceives—and he certainly does perceive something—is not identical with a physical object, since in this case no such object exists.

Nor is physical science any kinder. The information which has been obtained by physicists with regard to the nature of matter and of light, and by physiologists with regard to the machinery of perception and more particularly the workings of the nervous system, have an important bearing on the problems under discussion It is common knowledge that many physicists deny the existence of an external world of solid material things, and are inclined to adopt views not dissimilar from those of Kant, according to which the apparently independent objects of the world outside us are really constructed by our own minds.

Heat and Sound

Heat, according to the physicist's account, is caused by or *is* the energy, both kinetic and potential, of the motion of molecules. Consider, for example, the case of a gas. It consists of molecules, of about a hundred-millionth of an inch across, with comparatively large spaces between them, moving about in all directions with an average speed measured in hundreds of yards a second. The molecules meet and collide, and in consequence of their collision the gas has a certain temperature. If the gas is placed in a flame or hot body, the molecules of which it is composed will gain in energy, moving rapidly and colliding more violently. Imperceptibly the temperature of the gas will go up; heat, as we say, is generated. But the cause of this heat is the greater energy of motion of the molecules; or, to put it as a text-book of physics would put it, heat *is* nothing but the energy of motion of molecules.

Similarly, sound is said to be caused by, or alternatively to *be*, waves in the atmosphere. These waves vary in length, in frequency of vibration, and in mode of vibration. Variations in length determine the loudness, in frequency of vibration the pitch, and in mode of vibration the quality of the sound. Sound, then, is produced by atmospheric waves. Atmospheric waves are described as regions of pressure and rarefaction in the atmosphere moving forward with a certain velocity, and the movement of such a region of the atmosphere is the cause of, or *is*, sound. Thus the properties of the atmospheric waves the sounding body gives out determine the character of the sounds.

Smell and Colour

Smell is, or is caused by, or consists of, molecules given off in the form of vapour by the substance which in ordinary language is said to smell. Smell, it is interesting to note, is not even for common sense a property which is attached to the object; a smell, it is thought, is something *given off by* rather than something which belongs *to*. Most significant of all is the case of colour. Colour is often described as a quality of light; it is, at any rate, intimately bound up with light, so that where there is no light there is no colour. Now light, says the physicist, is, or is caused by, a certain set of wavelengths of varying frequencies in the electromagnetic spectrum. Within this section of wavelengths which are, or which produce, light, certain subsections are earmarked for the different colours. At one end of the section, that containing waves of shortest wavelength and highest frequency, are violet rays; at the other, red rays. Beyond violet are the ultraviolet rays, which are classed with violet for convenience, since they cannot be seen: below red, at the other end of the section, are the

infra-red, which equally are red for convenience only. Between lie the other colours. Thus, just as light-waves constitute a particular section of the waves graded according to length and frequency in the electromagnetic spectrum, most of which are not visible, so each colour is constituted by a subsection of waves of particular frequency and wavelength falling within the light section.

These scientific descriptions of the qualities which characterise the world of our everyday experience have an important point in common: the scientific objects in terms of which the qualities are analysed are themselves devoid of the qualities in question. Thus physics takes the ordinary qualities of the world we perceive and analyses them into something else. The world we see is coloured, the world we hear noisy; but the world of physics is neither coloured nor noisy. What, then, has become of colour and noise? The obvious answer is the Idealist one that they are supplied by the mind of the perceiver.

Physicist's View of Perception

Most people would say that the physicist's world is in some sense more real than the sensory world, or at any rate that the physicist gives a truer account of the nature of things than the man in the street; and this view is certainly shared by most physicists. It is desirable, therefore, if we are to determine whether the outside world really contains qualities or not, to consider very briefly what happens, according to the physicist, when something external to ourselves is seen.

Let us suppose, then, that I am a modern physicist who is looking at a distant object. This object I believe to be a highly complicated set of physical processes, which are electrical in character. I know further that a physical process, which I call a light ray, starts from the object and travels through the intervening medium of the atmosphere, being changed in the course of its journey into another physical process, which ultimately reaches the retina of my eye. Here it is changed into, or provokes, another physical process, which travels along my optic nerve, where it changes into yet another physical process and produces some effect on my brain about which I know very little for certain, but which I assume to be also some kind of physical process.

When this physical process occurs in the brain, there ensues a process of an entirely different kind, namely a *psychological* event which I call seeing. This is directed not upon the physical process in the brain which was the latest physical *cause* in the chain of events which preceded it, but upon what is called the object, which I know in my capacity of physicist to be a set of complicated physical processes which happened earlier in the series of processes than the brain process, this earlier set of physical processes being selected apparently arbitrarily from among the chain of physical processes which preceded the occurrence of the physical process in my brain.

Now, this account involves a number of inferences, two of which in particular rest upon assumptions which may be mistaken. I am looking, let us say, at the star Sirius on a dark night. If physics is to be believed, light waves which started to travel from Sirius some years ago reach (after a specified time which astronomers calculate) the earth, impinge upon my retinas and cause me to say that I am seeing Sirius. Now the Sirius about which they convey information to me is the Sirius which existed at the time when they started. This Sirius may, however, no longer exist; it may have disappeared in the interval taken by the travelling light ray. To say that one can see what no longer exists is absurd. It follows that whatever it is that I am seeing, it is not Sirius. What, in point of fact, I do see is a yellow patch of a particular size, shape, and intensity. I infer from my knowledge of astronomy that this yellow patch had an origin, with which it is connected by a continuous chain of physical events, several years ago and many million miles away. But this inference may be mistaken, the origin of the yellow patch which I call a star may be a blow on the nose, or a lamp on the mast of a ship.

Knowledge and Deduction

Nor is this the only inference involved. It is true that I *think* I am seeing a yellow patch, but am I really justified in holding this belief? So far as physics and physiology are concerned, all that can justly be said is that the optic nerve is being stimulated in a certain way, as a result of which certain events are being caused to happen in the brain. Is anything more than this really justified? Possibly, but it is important to realize that, if more than this is said, an inference is once again involved, and once again the inference may be mistaken. Directly we go beyond the bare statement "the optic nerve is being stimulated in such and such a way," and conclude from this fact "therefore I am seeing an object of such and such a character," we are drawing an inference and are liable to fall into error. What, then if the physicist and physiologist are right we, in fact, know are certain events in our own brains. The outside world is not itself known; its existence is merely an inference due to the fact that we think these events must have a cause. Perception by touch makes the matter even plainer; again the inference may be wrong.

If the teaching of physics and physiology are accepted, what is known in perception are not

the movements of matter, but certain events in ourselves connected with those movements; not objects external to ourselves, but the effects of the impact of light rays and other forms of energy proceeding from these objects upon our bodies. This, in general, was the view taken by the astronomer Sir Arthur Eddington (1882-1944). The external world was for him not something that we perceive, but something that we construct from messages that reach the brain along the nerves. The mind, he says, "weaves an impression out of the stimuli travelling along the nerves to the brain." Illustrating this conception, he makes use of a vivid simile, which likens the mind to an editor sitting in his inner sanctum receiving messages from a number of different reporters and, with the aid of a good deal of invention, piecing them together into a story.

The material which reaches the brain along these channels, the material which the mind must utilise for its story-making or world-building, is of the scantiest. Colour, temperature, sound, texture, all are lacking. These are not qualities which are given to us from outside, but qualities with which the mind invests the material which reaches it, "fancies" which it projects into the external world. Even the structure of familiar things, their "substantiality" and apparent permanence, are bestowed upon them by the mind.

Idealist Views

It is not difficult to see why physicists adopt idealist views. In contrast to the roundabout and indirect nature of our knowledge of the external world, there are placed the directness, the immediacy and the certainty of the mind's knowledge of itself. Our knowledge of the external world, it seems, is something which results from a long chain of messages which have travelled along intricate and roundabout lines of communication. But, to quote Sir Arthur Eddington, "there is one kind of knowledge which cannot pass through such channels — namely, knowledge of the intrinsic nature of that which lies at the far end of the lines of communication." This knowledge, which is direct knowledge of something as it is in itself, is knowledge of a mind. "Mind," he says, "is the first and most direct thing in our experience. All else is remote inference." We have, he continues, "an acquaintance with the mental and spiritual nature of ourselves, known in our minds by an intimate contact transcending the methods of physics." If the one thing which we know as it really is turns out to be a mind, might it not also be the case that other things, if they could be known as they really are, that is to say, from inside, would turn out to be mental, too? Thus we reach the familiar conclusion that the reality of things is probably mental, and that the material world is really a form of appearance which mental existences present to certain finite intelligences and partial points of view. Material phenomena, in fact, are the results of abstraction and selection by our own minds from a spiritual reality which underlies them.

Consciousness and Matter

The astronomer and mathematician Sir James Jeans (1877-1946) envisaged the world as a thought in the mind of its Creator, Himself conceived as a mathematician. This is a product of the same line of thought as Eddington's: Jeans supported his view by rather similar arguments. Nor are these views, as sometimes suggested, peculiar to British scientists. Famous Continental physicists, such as Einstein, Schrodinger, and Planck, incline to think of consciousness as fundamental, and of matter as something derived from consciousness.

It should, however, be strongly emphasised that these conclusions are not in any way necessitated. Nor can it be said that they have won much general favour among philosophers. What has happened is that, owing to certain recent developments in physics, many scientists have come to adopt those views of the external world which are to be found either in Berkeley's philosophy or in Kant's. The fact that scientists have come to share the views of these philosophers does not necessarily prove them to be true; nor does it remove the very serious objections to which idealist interpretations of the universe are exposed.

The state of physics is at the moment too transitional to enable any definite philosophical conclusions to be based upon the theories of physicists. Three main positions which may be regarded rather as starting-points for further inquiry than as established conclusions are permissible, and any of them may be adopted. (1) We may take, as Sir Arthur Eddington did, an idealist line and hold that the only thing we directly know is our own experience, that this is continuous with an all-pervading spiritual reality, and that the apparent world of matter is the result of an arbitrary selection from this spiritual reality. (2) We may hold that the only events that we can possibly know are those taking place in our own bodies and brains — this is known sometimes as the "under-hat philosophy" — and that the external world is merely an inference from these events. (3) We may hold that what we directly know are sense data, and that the worlds both of scientific objects and physical objects are somehow constructed out of sense data. The difficulty of this view is to work out a satisfactory theory of the relations between these different worlds.

LESSON 14

Materialism and its Critics

MATERIALISM has its roots in the science of the late 19th century, and in order to follow its rise it is necessary to consider the speculations and controversies which began with the publication of Darwin's *The Origin of Species*. Materialism, or the belief that matter, however defined, is the sole type of existence in the universe and that the laws which govern the movements of matter are therefore fundamental and all-embracing, was backed by all the contemporary science of the late 19th century. Its main support was, however, derived from evidence supplied by biology and psychology.

Darwin's work had shown that the evolution of life upon this planet was a continuous process from the single-celled amoeba, in which it first manifested itself, to its culmination in the human race. This development was achieved by means of a process of natural selection. Variations in species occurred ; the offspring would be either more or less suited to their environments than their parents ; those that were suited to their environment prospered, chose mates in whom a similarly advantageous variation had appeared, and handed on the variation to their offspring. Creatures that varied in a manner unsuited to their environment died off. As to the cause of the initial variations upon which the law of natural selection operated, Darwin confessed agnosticism. It must be presumed, therefore, that the initial variations were to be ascribed to chance.

The other main theory in the field, that of Lamarck, ascribed the changes in, and development of, living organisms to the effects upon them of changes in their external environment. As the environment changed, living organisms either succeeded in adapting themselves to it, or they did not. If they were successful, the variation in the organisms resulting from the adaptation gradually became established so that a new species came into being. If the variations were not established the non-adaptable creature died out.

These theories had an important point in common. In order to explain the whole process of development that has led from the amoeba to man, including also the development of intelligence in man, they found it necessary to invoke neither mind nor purpose, neither creative force nor divine agency ; they relied solely upon the operation of natural forces. Darwin ascribed the development to chance variations of which the fittest survived ; Lamarck to the automatic adaptation of creatures to their environment. Complete determinism results in either case, since all changes in living organisms, including human beings, will be the result of prior changes in the external environment to which the human being or other living creature responds. It is obvious, if this view is correct, that, just as the body is relegated to dependence upon its external environment, so a particular theory of the status and function of mind—a theory which equally relegated mind in its turn to complete dependence upon the body is required. This theory was supplied by 19th-century psychology.

Interaction of Body and Mind

If body and mind be conceived as completely different sorts of entities, the question of how they manage to interact presents serious difficulties. The attributes of the body are those of any piece of matter—weight, size, mass, occupancy of space, and so forth and the movements of the body obey the laws of physics. None of these attributes belongs to the mind. The mind has neither weight nor size nor shape, it does not occupy space, and its contents are not atoms and electrons, but the stream of thoughts, images, volitions, etc., which make up consciousness. If it has no single quality in common with the body, how can it establish that contact with the body that interaction implies ? How can it influence the body or be influenced by it ?

Descartes solved the difficulty by regarding the apparent synchronisation between mental events and bodily events as due to divine intervention. There was, he held, no causal connexion between mind and body, but God had so arranged matters that any event in the one was accompanied by a corresponding event in the other. This view, known as psycho-physical parallelism, was unacceptable to science, and, since the difficulty of conceiving interaction between entities completely different in kind seemed insurmountable, science met the situation by denying the difference. The body obviously was material ; the mind, then, it was inferred, must be material, too. Hence arose a conception of consciousness as a very attenuated form of matter, a sort of glow surrounding the brain, whose function was limited to registering or lighting up the events which occur in the brain. Since the glow of consciousness could not light up events which were not there, it followed that nothing could occur in the mind which had not previously occurred in the brain. Hence all mental events were

dependent upon and determined by preceding bodily events, and free will was a delusion.

If the mind, a particular sort of emanation from the body, is determined by the body, and the body by events in the external world, the chain of cause and effect leading from movements of matter in the material universe to the thoughts of human beings is complete. The universe in which we live seems to develop according to necessary laws, which are ultimately of the same kind as those studied by physics. Mind and spirit are not fundamental, but late and unimportant arrivals in a material universe, the products of material conditions. Causation proceeds always from the less living to the more. Living organisms are determined by the external environment in which they are placed, and within the living organism the mind is determined by the bodily and nervous system of which it is the mere reflection. Hence the laws which are appropriate to happenings of every kind are those which govern the movements of small particles of matter. To quote the British mathematician and philosopher A. N. Whitehead (1861-1947):

> Little lumps of material moving in space according to necessary and inevitable laws have produced our hopes, our fears, the scent of the rose, the colours of the sunset, and the mystic's experience of God. They have also produced our knowledge of the little bits. Mind, in short, is merely the consciousness of the bits by themselves

When the conditions favourable to living organisms have passed away, we may expect life to disappear, finishing its pointless journey with as little noise and significance as in the person of the amoeba it began it. Meanwhile the universe as a whole may be conceived after the model of a gigantic clock, functioning as the result of the automatic interaction of its parts.

The philosophical implications of the materialistic view of the universe are: (1) free will is an illusion; (2) mind is an emanation from the body, and the body a product of material forces; (3) there is no purpose or plan in the universe; (4) there is no Creator; (5) the law of cause and effect which operates in the world of matter is ultimate, and applies also to life.

Some Criticisms of Materialism

The materialist theory of the universe is open to criticism from a number of different points of view. From the side of biology, data have been accumulated which make it difficult to believe that the behaviour of living organisms can be adequately interpreted on the assumption that they are merely highly complicated automata reacting to the stimuli of their environment. In psychology, although materialist interpretations have, under the name of Behaviourism, achieved a wide vogue, it is nevertheless the fact that an adequate account of consciousness in terms of the movements of the brain and the nervous system is as far from being successfully given as it has ever been. The researches of modern physicists into the nature of material things have resulted in a concept of matter at once too vague and too intangible to form any longer an adequate foundation for literally everything that exists. Finally, materialism is exposed to various difficulties of a logical order. If what it asserts is true, thought is only a reflection of, or function of, the brain. I think what I do, not because I am constrained by any external evidence to which I have paid attention and which determines my view, but because my body and brain are in a certain condition. An idea is therefore an event of the same type as any other bodily event. It follows that it is meaningless to ask whether an idea is true—as meaningless as to ask whether one's blood pressure is true.

Now, materialism is a system of ideas. If, therefore, what materialism asserts is true, materialism is not a statement to the effect that the universe is of a certain kind, it is only evidence that the brains of materialists are in a certain condition. It is therefore meaningless to ask whether materialism is true. All that we are entitled to say is that the mental reflections of brains in a certain condition, namely the brains of materialists, produce or are that system of ideas to which we give the name of materialism. Hence, if materialism is true, materialism does not give us information about the universe.

Vitalist Philosophies

In the light of these considerations there has arisen a movement in modern philosophy which, while taking fully into account the fact of evolution and all that it implies, affirms the primacy of mind or spirit in evolution. The movement takes various forms, of which perhaps the most celebrated is that which finds expression in the philosophy of Bergson; another, which will be found in the writings of Samuel Butler and Shaw, has been developed into a general system of philosophy in C. E. M. Joad's *Matter, Life and Value*, another is in Professor S. Alexander's famous book, *Space, Time and Deity*; a fourth is to be found in the works of the Italian philosophers, Croce and Gentile, who, combining the conclusions of Hegel as to the primary reality of mind with the evolutionary conception of mind as a developing dynamic process, find in the experience of the individual spirit of man, which is conceived as active and changing, a model on which to interpret the universe as a whole.

Theories of this type may perhaps most conveniently be studied in the writings of Bergson, an original expositor of the modern vitalist point of view who has the advantage of a capacity for persuasive presentation unequalled since Plato.

The "Elan Vital"

The main features in Bergson's philosophy are the following. The process of evolution cannot, he holds, be satisfactorily explained merely in terms of adaptation to environment. A degree of physical adaptation, which is far superior to that exhibited by human beings, was achieved thousands of years ago by the elephant and the tortoise. Why, then, does evolution go on to produce man, unless it is the embodiment of some purposive force which aims at developing higher *quality* life ?

Such a force, called by Bergson the *élan vital*, is affirmed by him to be the fundamental reality of the universe. It is pictured as an ever-active, ever-changing, developing urge, which expresses itself in all the phenomena which constitute the universe.

Bergson is led to this conception by a consideration of the nature of change, and his conception of change is in turn derived from an examination of our own consciousness. At first sight our consciousness seems to consist of a succession of psychic states or conditions strung out along the thread of a continuing personality, the ego, much as beads are threaded on a necklace. Closer inspection, however, shows this view to be erroneous, and the error consists in supposing that each particular psychic state or condition remains constant while it persists. In fact, says Bergson, there is nothing in any psychic state but a constant flow of change. Take, he says, "the most stable of internal states, the visual perception of a motionless object. The object may remain the same. I may look at it from the same side, at the same angle, in the same light ; nevertheless, the vision I now have of it differs from that which I have just had, if only because the one is an instant older than the other. My memory is there, which conveys something of the past into the present." The conclusion is that "we change without ceasing and the state itself is nothing but change." The conception that we are beings who endure by change—that we are, in fact, simply elements or currents in a stream of change—is then developed into an account of the universe as a whole. This, too, is conceived as a vast vital surge or activity without beginning or end, the movement which we know as consciousness in ourselves and as evolution in the external world.

Matter and the Intellect

The appearance of solid, static objects extended in space, which the universe undoubtedly presents, is, says Bergson, a figment of the intellect. The intellect is a practical faculty evolved by life to assist the individual in the business of living. Since life in an all-pervasive homogeneous vital surge would present difficulties, the intellect makes cuts across the living flow of reality as a result of which it appears congealed as a number of separate static objects, a series of "stills."

Hence matter is the way in which the intellect represents reality to us. Matter is also envisaged as the backward flow of life. If life is pictured as a fountain jetting into the air, matter is the spent drops that fall back.

Intuition

The faculty by virtue of which mankind comes to apprehend the nature of reality as it is, is not intellect but intuition. This faculty, which is most highly developed in insects, is more akin to instinct than to intellect, and may be best described as instinct guided and informed by intelligence. By means of it, Bergson claims, we can, while attending to the pulse of life within ourselves and sensing the flow of our own consciousness, come to realise that this is but a part or aspect of the same dynamic stream that constitutes the universe itself. The flow of our consciousness is the reality of which we are most indubitably aware, and it is in terms of this psychical flow that reality as a whole is to be conceived.

LESSON 15

Problems of Ethical Philosophy

GENERALLY treated as a separate branch of philosophy, the province of ethics is, however, no less difficult to define than that of philosophy as a whole. Philosophers are commonly agreed that it is concerned with the meaning of such words as "right" and "good," with the nature of duty, and with the validity and character of the obligation which we feel to do our duty. Ethical philosophers have also been concerned to find a criterion by means of which to distinguish right actions from wrong and to lay down the principles of right living. It is very difficult to separate the treatment of these questions from the problems of philosophy as a whole, since the view which a particular philosopher takes in regard to them is largely determined by what may be called his general philosophy. For example, if he is a Materialist, he is bound to deny the freedom of the will, since on a Materialist view either the mind is itself a form of matter, or it is determined in respect of all its activity by the movements of the brain. These movements are themselves determined according to the laws

of physiology, which can theoretically be derived from physics, and the apparent freedom of the mind must therefore be an illusion. If there is no freedom, ethics becomes meaningless. Ethics is a structure built upon the twin pillars of praise and blame, and if a man is not free, it is as irrelevant to praise him for doing what is right as it is impertinent to blame him for doing what is wrong. Thus ethics falls to the ground.

Utilitarian Theories

For the purpose of this brief treatment, ethical philosophies may be broadly divided into two types: (1) those which assess the morality of an action in terms of some intrinsic property or properties alleged to belong to the action, or, sometimes, in terms of the motive from which the action was performed, or the will from which it proceeded; (2) those which assess the rightness or wrongness of an action in terms of the consequences which follow from that action. Theories of the second type, usually known as Utilitarian theories, will first be considered.

The theory of Utilitarianism was first advanced in its modern form by Jeremy Bentham the socio-legal reformer (1748-1832). It involves two separate sorts of assertions: (a) the ethical value of actions depends entirely on their consequences; (b) of these consequences only pleasure or happiness is to be regarded as valuable. The doctrine involved by this second assertion is Hedonism (from the Greek word *hedone* meaning "pleasure").

With regard to the first of these assertions, according to Bentham and J. S. Mill, a right action is one that has the best consequences on the whole. Two points may be noticed. (1) By best consequences is meant best actual consequences, not best expected consequences. If, therefore, an action done with the best possible intentions unexpectedly turns out badly, it is a wrong action. It follows that it is sometimes our duty to do actions which are ethically wrong. (2) As we can never know all the actual consequences of an action, it is impossible to tell with absolute certainty whether an action is right or wrong. Thus Utilitarianism, while it assigns a *meaning* to the words "right" and "wrong," only provides a rough test for measuring the rightness or wrongness of particular actions. There is here no absolute standard.

Psychological Hedonism

The doctrine of Hedonism, that "pleasure is the only good," is of great antiquity in philosophy. It derives its strength from the fact that in the case of any action it is always possible to advance reasons for thinking that it was undertaken with the object of obtaining pleasure for the agent. Stating the theory shortly, it may be said that individuals always do what, after calculating the probable consequences, they think they will like most. They may, of course, and no doubt often do, make mistakes as to what consequences they will like most—but the fact that they make such mistakes does not, it is said, invalidate the general truth of the thesis that they do always in fact act in the way which they *think* will give them most pleasure.

Hedonism Criticised

It seems fairly clear that the assertion which some Hedonists make to the effect that pleasure is the *sole* good is mistaken. In the first place, if pleasure is *The Good*, in the sense that everything which is good is pleasure, and vice versa, and that there is no good, therefore, except pleasure, then for the word "good" we may read the word "pleasure" without any change of meaning. Now, the statement "pleasure is the good" may be right or it may be wrong, but it can at least be intelligibly discussed with a view to determining whether it is right or wrong. But the statement "pleasure is pleasure" is merely the assertion of an identity. Therefore the statement "pleasure is the good" cannot mean the same as the statement "pleasure is pleasure." Therefore good, or The Good, cannot be absolutely identical with pleasure, from which it follows that good must mean something other than, or at any rate additional to, pleasure.

In the second place, the argument for Hedonism rests upon a false psychology. We can see this by taking a concrete instance. If Hedonism is true, all would have starved in infancy. If an infant did not suck at the breast, it would starve. On the first occasion on which it sucks it cannot be motivated by the expectation of pleasure or the desire to obtain pleasure, since, if the occasion were *really* the first, it could not know whether it would obtain pleasure from the action or not. Consequently if, as the Hedonists assert, the only possible motive for any human action is to obtain pleasure, it is impossible to understand why the infant should have sucked on the first occasion—that is to say, it is impossible to understand why it did not starve.

The psychology of Hedonism is based upon two truths which may be stated with some degree of confidence. The first is that the satisfaction of any desire brings some pleasure; the second, that the value of actions depends upon, is indeed ultimately assessable only in terms of, their effect upon some human consciousness. But while it embraces these truths, Hedonism makes assertions which go far beyond them. Because all satisfaction of desire brings pleasure, it does not follow that the

motive for all our actions is the desire to obtain pleasure. A system of philosophic thought, widely prevalent during and following the Second World War, combined Hedonism with a curious blend of Idealism and Materialism. This was called Existentialism, its basis being the individual's intense consciousness of his own existence and the paramount need for him to give full expression, at whatever cost to the community, to his individuality.

In actual experience people desire specific things without really considering whether they will experience pleasure by obtaining them, and they obey particular impulses without considering whether the results of giving way to them are likely to be more pleasant than those of resistance. The fact that pleasure enriches our mental state when we have obtained the thing or satisfied the impulse does not justify us in saying that, *as a matter of actual experience*, it was our desire to obtain this pleasure which prompted our action. To make this assertion is to put the cart before the horse. Hedonism rests on the assumption that human beings are always rational and purposive, that they always deliberate about the results of their actions and act in order to secure certain specific ends. This belief is a delusion. Many of our actions are purely impulsive in character and are not done with the object of securing any end. When a man breaks the furniture in a rage, boasts, ducks to avoid a flying cricket ball, or shrinks from a ghost, he is not acting with any demonstrable object at all certainly not with the object of obtaining pleasure.

Bentham's Utilitarianism

In addition to the psychological doctrine described above Jeremy Bentham advocated the ethical doctrine that we ought always to promote the greatest happiness of the greatest number. This is not, as would first appear, necessarily inconsistent with the psychological doctrine that we can act only so as to promote our own greatest pleasure, since, according to Bentham, to promote the greatest happiness of the greatest number was also to obtain the greatest possible amount of pleasure for oneself. The reason for this is that society has taken care to secure the performance of those acts which benefit it, by arranging that they shall automatically conduce to the pleasure of the agent. The brave man, for example, is happier than the coward because society rewards bravery, which benefits it, and discourages cowardice, which endangers it.

Mill's Modifications

J. S. Mill introduced two important qualifications into the doctrine of psychological Hedonism, which in effect amount to the abandonment of the view that the pleasure of the agent is the only possible object of desire, and hence that pleasure is the sole good. He introduces a distinction between different types of pleasures. Bentham had said, " Quantity of pleasure being equal, pushpin is as good as poetry." Mill, however, held that we ought always to prefer a smaller quantity of a higher pleasure to a large quantity of a lower, that, in short, it is " better to be Socrates dissatisfied than a pig satisfied." But, it may be asked, why should we prefer a smaller quantity of higher pleasure, unless that smaller quantity contains some element of value which makes it more desirable than the larger quantity of lower pleasure ? This element of value cannot itself be pleasure, since, if it were, the smaller quantity of higher pleasure would be just *more pleasure*. Hence we are driven to admit elements of value which are not pleasure. In the second place, Mill held that it was our duty to promote what he called Social Good, that is to say, the greatest happiness of the greatest number, even when other courses of action more conducive to our own individual happiness are open to us. He abandoned, that is to say, Bentham's contention that the greatest happiness of the individual *always* lies in promoting the greatest happiness of the greatest number, and held that, where they conflict, the latter *ought* to be preferred to the former. Thus, though Utilitarianism may succeed in establishing the validity of the assessment of the ethical value of actions in terms of their consequences, the attempt to establish pleasure as the only consequence of value breaks down.

Moral Sense of Mankind

Many writers on Ethics have held that actions possess in themselves some intrinsic quality in virtue of which they have ethical value. This quality is recognized as belonging to the action by a special faculty known as the moral sense or conscience. The deliverances of conscience are intuitional—that is to say, though they may be defended by, they are not based upon, reason ; they are also final. The moral sense, that is to say, is arbiter over all that pertains to the moral sphere, just as the sense of sight is arbiter over all that pertains to the visual sphere. Our eyes tell us what is beautiful, the moral sense tells us what is right ; and there is no appeal against either verdict.

In some forms of the moral sense theory it is maintained that good actions are those which spring from or are motivated by a particular part of our nature, and in the most famous form of this theory the particular part of our nature in question is held to be in some sense continuous with, or an expression of, reality.

This latter view was advanced in an extreme form by Kant (*see* Lesson 9). It is only in so far as he acts morally, willing to do his duty

whatever the cost, that, according to Kant, a man is free. As a moral agent he escapes from the law of cause and effect which governs the phenomenal world, and acts freely as a member of the real or noumenal world. Translated into psychological terms, the theory may be stated as follows. Man as a member of the phenomenal world is a creature of desire. A complete knowledge of his temperament, past history, and dominant impulses at any given moment would enable an observer to predict exactly how he would act in any given situation, *in so far as he acted according to his desires*. In so far, therefore, as he acts according to his desires, he is not free. But his moral self, which is expressed in a free will, prescribes for him what is right irrespective of his desires, and, in so far as he follows its dictates, he is acting freely because he is acting in accordance with his own real nature.

Kant's doctrine, then, amounts to this, that we should act in every case in accordance with general principles which the will intuitively recognizes as binding. Unfortunately this doctrine affords little practical guidance in the doubtful moral situations arising in everyday life. The general principles which the will lays down are, indeed, rational enough; Kant points out, for example, in regard to them, that they can be universalised, whereas conduct in accordance with the contradictory principles cannot be universalised.

It is possible, for example, for everybody to tell the truth, but if everybody lied, nobody would believe anybody else, and there would be no point in lying. But it is obvious that in practice all general principles admit of exceptions—e.g., it may be right to lie to a lunatic—and for these Kant's system does not provide.

The important part of Kant's doctrine, which is embodied also in that of the other writers of the moral sense school, is his insistence on the special and unique character of the "feeling"—to use a non-committal word—that we have in regard to certain actions or classes of actions. We recognize instinctively and immediately it is said, with regard to those actions and classes of actions that they are right and ought to be done, even if we, in fact, do the contrary. It is because of the *directness and certainty* of this feeling that the deliverances of the moral sense are sometimes called intuitions.

That people's moral intuitions differ in different ages and countries is admitted; it is admitted also that analysis may show a close relation between what the moral sense of a people pronounces to be right and what conduces on the whole to the advantage of the society to which they belong. These facts do not, however, it is said, diminish the authority of our moral judgements. On the contrary they strengthen it.

In recent years an attempt has been made to get rid of old philosophical difficulties by a rigid system of examination of terminology. The logical positivists, as they are called, are dogmatic philosophers who insist on a single lear meaning for each term used. Some go-even farther and use symbols, like those of emathematics, where words might be misunderstood. The idea was good, but it led to abuses inherent in its very nature. Special uses of terms or of symbols have to be learned and remembered; many proved unequal to the task, others simply misunderstood the underlying purpose. Logical positivism attracted much attention over a period of some years. But the problems of the 1950s demanded more of philosophy than logical positivism could give, and there began to emerge a new synthesis of the ancient idealism, later realism, and modern scientific empiricism.

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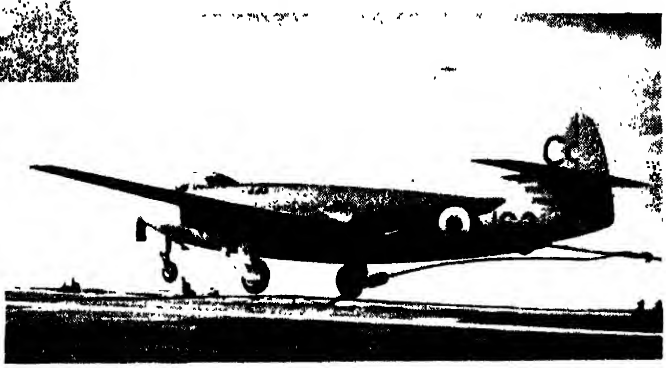
ENGLISH ELECTRIC CANBERRA. The first British jet bomber, the Canberra is also used as a reconnaissance and ground attack aircraft. It is powered by two Rolls-Royce Avon engines each developing 6,500 lb. static thrust, and has a speed exceeding 600 m.p.h.

GLOSTER JAVELIN. A two-seater all-weather fighter, the Javelin was the first twin-engine delta-wing aircraft. It is powered by two Armstrong-Siddeley turbo-jet engines each developing 8,300 lb. static thrust

HANDLEY PAGE VICTOR. Powered by four Armstrong-Siddeley Sapphire turbo-jet engines, the Victor bomber was the first aircraft to use the so-called " crescent " wing. The angle of sweep of each wing is progressively decreased from root to tip, with the outer sections only slightly swept.

HAWKER HUNTER. The Hawker Hunter (see also Fig. 16) is a single-seater swept-wing fighter armed with four 30 mm. Aden cannon In 1953 a Hunter set up a world speed record of 727·627 m.p.h.



HAWKER SEA HAWK. Here seen landing on a carrier deck, the Sea Hawk is a naval version of the Hawker Hunter. It is powered by a Rolls-Royce Nene turbo-jet.

AERONAUTICS

*W*ITHIN *a period of half a century the aeroplane has developed from a mechanical curiosity into a major industry and one of the most important of man's activities. The aeroplane has made it possible to travel faster than the speed of sound and has revolutionised all conceptions of travel. Much of the aeroplane's progress has been due to the impetus of war, but these Lessons are not concerned with the aeroplane as a military weapon. Their purpose is to give an understanding of the theory of flight, the design and construction of aircraft and their power units, and the organisation that makes possible the air routes that have turned journeys which once took weeks into flights of a few days. The Lessons are illustrated by carefully selected diagrams and photographs.*

The principle of the internal-combustion engine, which no longer has such an important place in aviation, is dealt with in the Course on ENGINEERING *in Vol. 5.*

15 LESSONS

LESSON 1

Theory of Flight

AERONAUTICS is a word deriving from the Greek *aerios*, air, and *nautikas*, navigation, and it can be defined as the science and practice of aerial navigation, and the design, production, and operation of aircraft and ancillary equipment

Aircraft are of two main types: those lighter than air and those heavier. The lighter include the balloon, the motion of which can be controlled only vertically, and its later development, the powered airship, the motion of which can be controlled vertically, horizontally, and laterally.

Aircraft heavier than air include the kite and the glider, which have no source of power and depend for their motion upon winds and air currents, and the powered aircraft or aeroplane, which can move in any direction according to the skill and will of its pilot

Balloons and airships now have little practical application, and in these Lessons the term aeronautics is confined to the two principal heavier-than-air craft, the aeroplane and the glider, and all pertaining to them

Aeroplanes and gliders are able to suspend the force of gravity and so to move through the air because of certain attributes peculiar to the air and certain characteristics of its behaviour Air is hardly noticeable while it is still, but immediately it begins to move it exerts pressure on any surface in its path, and the faster it moves the greater is the pressure it exerts.

Air Molecules

Like all gases, air is made up of molecules free to vibrate in all directions, but, unlike the molecules comprising solids or liquids, the molecules of air do not need to remain a fixed average distance apart. When air or any other gas is compressed, its molecules are forced closer together and thus bombard each other and any surface with which they come into contact, with increasing frequency and force.

It is this that causes increased pressure when the volume of a given weight of air is reduced. In other words, the density of the air has been increased, so that there are more molecules in a given space, resulting in more frequent molecular collisions within the air and against anything with which it comes into contact.

When part of an air space is disturbed, as for example by the flight of an aeroplane, the consequent molecular movement induces a transmission of energy through that air space. In the earth's atmosphere the speed of the energy induced by molecular collisions is the speed of sound, and this speed depends upon altitude. In cold climates or at high altitudes, where the air molecules vibrate more slowly or are farther apart, the speed of energy transmission is reduced.

Another characteristic of the energy induced by molecular collision is that such energy, because of interference between adjacent air layers, can be transmitted both across and along an air flow.

Boundary Layer

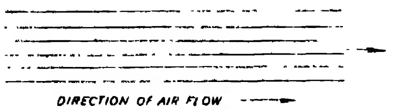
The simplest example of air movement is its passage across any flat, smooth surface. Theoretically, the direction of movement of the air molecules should continue in a straight line, but in fact the layer of molecules in actual contact with the surface is arrested by friction and remains on the surface; whereupon the transference of energy across the airstream slows down the adjacent layers of air, so progressively reducing the speed of the air flow the nearer it approaches the fixed surface.

The layers of adjacent air thus affected cause, in relation to an aerofoil or aircraft surface, formation of what is called a boundary layer. No matter how smooth the surface, a boundary layer is always induced. The rougher the surface of the aerofoil is, the thicker the boundary layer will be. Moreover, the slightest disturbance to airflow over an aerofoil causes a turbulent boundary layer to roll across its surface and create eddies and whirlpools.

At this point it is important to remember that the energy and the consequent boundary layer generated when an airstream meets a surface are the same whether it is the air that is in motion or the surface against which it acts An aeroplane makes its own airstream by the fact of moving through the air. All motion is relative, and the fundamental principle of an airstream is the relative movement between the air and the surface with which it comes into contact (not the movement of either relative to the ground).

If an aeroplane is flying at 270 m.p.h. with a 30 m.p.h. following wind, its speed relative to the ground is 300 m.p.h. If it then turns and flies into the same wind, its speed relative to the ground is 240 m.p.h. But the airstream produced and the air eddies created are exactly the same in both cases.

Aerofoil shapes, and the effects of airstreams on them, are tested in wind tunnels. A model of the aerofoil is mounted in the tunnel through which an artificially created air stream is blown by a fan. As the airstream flows over the



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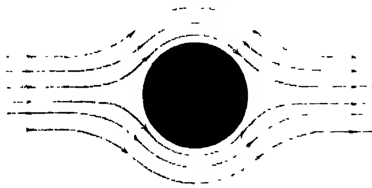


Fig. 2

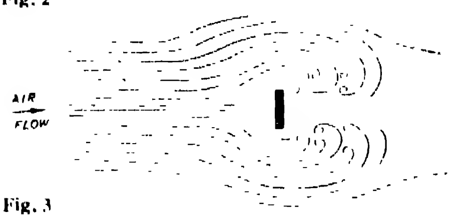


Fig. 3

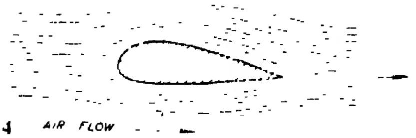


Fig. 4

Fig. 1. Unobstructed air flow, as in a wind tunnel. Fig. 2. Air flow interrupted by flat disc with edge in direction of flow causes minimum rear eddies. Fig. 3. Air flow interrupted by flat disc with its maximum surface at right angles to direction of flow causing excessive rear eddies. Fig. 4. Air flow interrupted by aerodynamically designed body, such as an aerofoil, causes no eddies.

stationary aerofoil it creates around it exactly the same conditions that would exist if the air were stationary and the aerofoil in motion This is illustrated in Figs. 1 to 4.

In Fig. 1 the air is shown as flowing in smooth lines from left to right as it would do through a wind tunnel and with no obstacle in its path. If a flat plate is placed in this flow, edge on, the disturbance will be small (Fig. 2); but let the flat plate be turned so that it is at right angles to the flow direction, and the result is as in Fig. 3. The airstreams divide as they approach the plate and then curve round its edges and eddy behind it, creating a region of disturbed or turbulent air.

The airstreams do not come together again in a smooth flow after they have passed the plate, but turn and twist like miniature whirlpools. Fig. 4 shows the difference when a streamlined, or aerodynamically designed, body is introduced into the airstream. The streamlined body is so shaped that it divides the air without causing eddy. The air flows over it and meets again with little disturbance.

An elementary form of aerofoil that creates an airstream by forward movement is the kite. When a kite is launched by pulling it forward by a string, the front is pulled against the air. This causes a pressure of wind under the kite and so raises it off the ground (Fig. 5). Pulling the kite faster increases the pressure of the air against and under it, the kite gradually climbing into the air at a shallow angle, its front slightly tilted.

The kite's tail keeps the front, or leading edge, of the kite higher than the end, or trailing

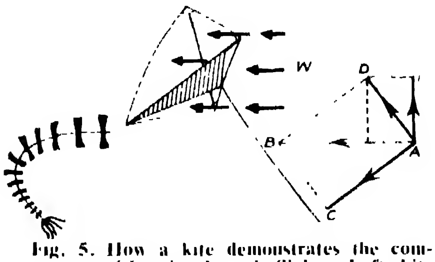


Fig. 5. How a kite demonstrates the components of heavier-than-air flight. Left, kite flying into wind (W) Right, aerodynamic forces: A, centre of pressure; B, drag; C, thrust; D, total aerodynamic force; E, lift; W, wind or air flow.

edge. The forward movement of the kite against the resistance of the air is called thrust, the resistance of the air to the kite is called drag.

Basically an aeroplane is a kite supplied with some form of motive power and fitted with a stabilising fin and movable surfaces to control its direction in flight The largest and most important fixed surface of an aeroplane is the wing, and upon its design and reaction to an airstream depend the design and position of the movable control surfaces.

Fig. 6 illustrates a normal wing or aerofoil and shows the leading edge, trailing edge, and chord. The chord is the measurement of a straight line running from the leading edge to the trailing edge and ignoring curve or camber This aerofoil has a camber or curve in its upper and lower surfaces, for a reason to be explained later

Fig 7 shows one of the most important measurements, which is the angle of incidence or angle of attack. This is the angle between the air flow and the chord of the aerofoil. It is more correct to call it the angle of attack because

Fig. 6

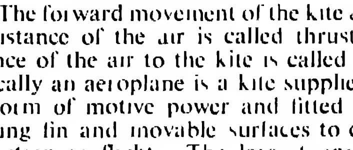


Fig. 7

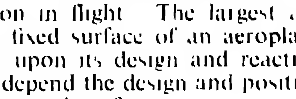


Fig. 6. Leading edge, trailing edge, and chord of aerofoil, e.g. aeroplane wing. Fig. 7. Angle of incidence or angle of attack of an aerofoil.

the term angle of incidence has other applications. When an aircraft is standing on the ground, its wings make an angle of incidence to the horizontal which seldom resembles the angle of attack when the machine is in level flight.

Fig. 8 shows the reaction of an aerofoil placed at a normal angle of attack in an airstream and the air flowing over it without eddying. Over the thicker part of the aerofoil, towards the leading edge, the airstreams rise fairly sharply, whereas under the aerofoil they are not much deflected. All the airstreams merge again at the trailing edge into a smooth flow. The hump that is seen over the thicker part of the aerofoil's camber has its special indication of lift, which will be discussed later ; first, the relationship between the aerofoil and the flat plate will be demonstrated.

In Fig. 9 the aerofoil is tilted up to a much steeper angle of attack. As a result the airstreams are broken up ; the air strikes the aerofoil and eddies over and under it, curling round into small vortices. This condition resembles that which occurred when the flat plate was placed in the stream (Fig. 3).

Lift

With the cambered aerofoil in the airstream the air flowing past it is deflected upwards, and it follows that the aerofoil tends to move with the air just as it would move upwards if it were pushed by a flow of water. The greater part of

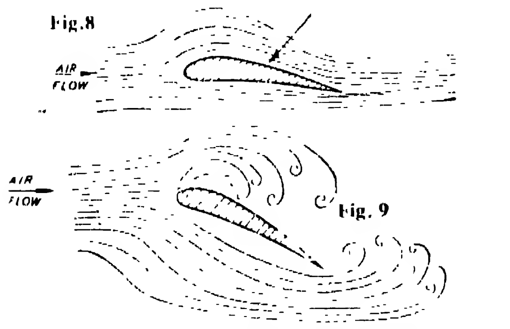


Fig. 8. Reaction of an aerofoil placed at angle of attack in an airstream so that rear eddies are at minimum. Fig. 9. Aerofoil at steep angle of incidence and inducing excessive rear turbulence

this lift is seen, in Fig. 8, to occur over the top of the wing, and only a very small part underneath it.

The whole principle of flight is based on this form of reaction between the relative airstream and the aerofoil over which it flows. Some bodies create drag and nothing much else. Others create lift. Others are merely streamlined bodies which produce no lift and very little drag. The aeroplane is made up of bodies of this kind. The wings, being the main lifting surfaces, have the cambered aerofoils as illustrated ; when the engine creates thrust so that the wings move forward through the air, they develop lift in the manner shown.

Besides the direct drag created by the resistance of the air to the forward movement of the aerofoil, there is surface friction drag resulting from the behaviour of the extremely thin boundary layer or skin of air next to the aerofoil surfaces. Surface friction drag can be ignored while lift and drag are discussed. When it is moved through the air by the thrust of the engine, the aerofoil is set to meet the relative airstream at a specific angle of attack, which partially governs the lift induced.

Angle of Attack

The relationship between the aerofoil and the lift is dependent upon the angle of attack, and when the aircraft flies slowly it does so at a big angle of attack to increase lift, but at the same time drag is increased. When it wishes to fly fast, the aeroplane reduces the angle of attack and so also reduces drag. The speed of the relative airstream adjusts the amount of lift, for (other things being equal) the faster the flow of the airstream the greater is the lift created from a good angle of attack.

Aspect ratio is an important consideration in wing design. It is a measure of the ratio of the wing span to the chord, and is expressed as.

$$\frac{\text{span}}{\text{wing area}}$$

Because all practical wing shapes have to be of finite span, losses result from the spilling of air from their under surfaces. Aerodynamic efficiency is improved by using wings of high aspect ratio, particularly when such wings taper to a tip. Unfortunately, practical considerations do not always permit the ideal wing shape.

With a piston-engine aircraft the airscrew is also an aerofoil working in exactly the same way as the wings. The blades generate lift, although in this case the direction of the reaction is more nearly horizontal than vertical, and it is called thrust. Like any other aerofoil, an airscrew has leading and trailing edges, a camber, and a chord, and the action of the blade on the air is the same as that of the wing.

The first problem that must be solved when applying the theory of flight to its practical application concerns stability. What has been said so far about the creation of lift by an aerofoil has nothing to do with aerofoil stability. It is possible to design a simple aeroplane without tail-plane or fuselage and make it stable.

The usual practice is to mount the main plane at one end of the fuselage and the stabilising or tail-plane at the other end. It is then possible to achieve a form of stability comparable with

Fig. 10

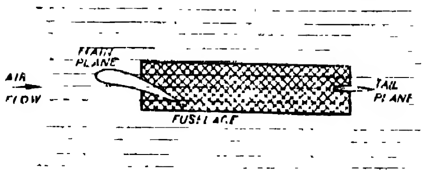


Fig. 11

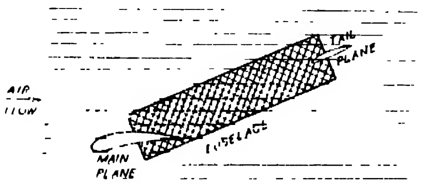


Fig. 12

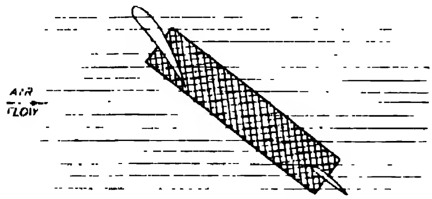


Fig. 10. Elementary arrangement of fuselage, main-plane, and tail-plane in air flow. The main-plane is at large angle of attack and tail-plane at zero angle of attack. Fig. 11. How a tail-plane restores fuselage stability when air disturbance dangerously reduces main-plane angle of attack. Fig. 12. How tail-plane restores fuselage stability when air disturbance dangerously increases main-plane angle of attack.

that secured by a weathercock. The weathercock, when a relative airstream blows across it, automatically adjusts itself so that it points into the wind, exactly the same principle applies to the aircraft with the orthodox type of tail carrying a fin, tail-plane, elevators, and rudder. These cause the aircraft to tend to align itself with the nose pointing into the airstream.

The tail-plane is set at a smaller incidence than the main-plane. If a fixed fuselage be taken as the measuring point, we have in Fig. 10 a pair of wings or aerofoils arranged on a fuselage with the main-plane at a fairly large angle of attack and the tail-plane at zero angle of attack. If the tail-plane were at a larger angle than the main-plane it would produce instability, for it would over-react to disturbances in the attitude of the aircraft.

But with the tail-plane set as shown in Fig. 10 at a smaller incidence, a disturbance which throws the aircraft off the level, such as is indicated in Fig. 11, brings the tail-plane immediately into position where it produces a reaction.

In Fig. 11 the tail of the aircraft has been cocked up suddenly, perhaps by disturbances in the air from a cloud or from irregularities in the ground. It will be seen that the main-plane, although not lifted so strongly as in Fig 10, when it was at a considerable angle of incidence, is still lifting slightly The tail-plane, on the other hand, is tending to be pushed downwards by the airstream and, since it is at the end of a long lever, it is tending to right the machine and to bring it back to a level keel.

The opposite occurs in Fig. 12, when the aircraft has been flung into an attitude with the nose up. Again the tail, working at the end of a long lever where it can get a strong purchase on the machine, develops lift and tends quickly to rise and right the machine The aircraft fin works in a very similar manner in the other sense, that is to say, about the vertical axis of the machine. The consequence of the fitting of the tail-plane and the fins is that the aircraft has a certain degree of stability. It has to be balanced according to the pilot's operation of the controls.

Another complementary device for achieving stability is the dihedral angle, illustrated in Fig. 13. The wings of the aircraft are tilted upwards from their roots as they extend from the fuselage, and the angle is measured from the horizontal. The working of the dihedral angle can best be visualised by imagining that the aircraft has somehow gone into an extremely steep sideslip (Fig. 14).

If the exaggerated dihedral angle is assumed, it will be appreciated that the lower wing meets and reacts from a much larger flow of air than the upper wing, so that its lift is increased and the aircraft tends to right itself.

Dihedral angle has been criticised because it tends to reduce wing efficiency. But with practical dihedral angles such deficiency is more than compensated for by the stability achieved.

Fig 13

Fig 14

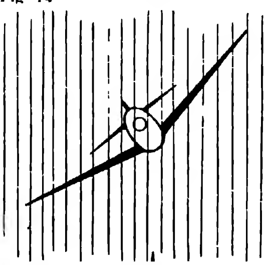


Fig. 13. Dihedral angle of wing relative to horizontal. Fig. 14. How dihedral angle causes an aircraft to right itself in a side slip owing to reaction between wing and lift force.

Fig. 15 shows the forces which act on a wing during flight. The lift force is represented by a vertical line running up from the centre of a flat plate. The drag which tends to hold a wing back is represented by the line drawn horizontally to the right from the same point on the flat plate.

The rectangle is then complete, and the diagonal line across it is the resultant of the lift and the drag together, and this represents visually the manner in which the forces act on this plate at this angle of attack. The resolution of the forces into lift and drag clarifies dis-

cussion of the various qualities of aircraft and the various means proposed for improving them.

In discussing aircraft lift problems, other factors must be considered. The first is the point at which the lift takes effect; the second is the point at which gravity takes effect, or, in other words, the centre of pressure and the centre of gravity. The juxtaposition of these two must be so adjusted that the aircraft is controllable.

Lift and Gravity

If the aircraft centre of gravity were on the tail-plane, the tail would fall and the aircraft would point itself straight up into the air. Conversely, if the centre of lift were somewhere around the tail-plane and the centre of gravity up by the nose, the aircraft would go into a vertical dive and crash.

There must therefore be a relationship between the centre of lift and the centre of gravity so that the pilot's controls are never overwhelmed by the balance of the machine. The tendency must be for the aircraft to nose down when engine-speed is reduced, but this tendency must not be excessive, and consequently centre of lift and centre of gravity have to be so disposed that they produce this effect of nosing down without producing an excessive tendency for the machine to nose down at all times.

The position of the centre of gravity varies with some aircraft according to the disposition of the load, but it is always advisable that consumable load, such as fuel, be disposed about the centre of gravity. Consumption of fuel then makes no change in the centre of balance of the aircraft.

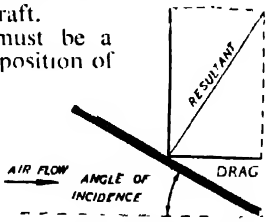


Fig. 15. Forces that act on an aerofoil.

In practice there must be a certain change in the position of the centre of gravity as the load is applied and discharged, but the design must be such that this change always takes account of the trimming and control arrangements and leaves the pilot a margin so that he can maintain full control over the aircraft.

The centre of pressure may be regarded as the point at which the total aerodynamic forces concentrate. If the aircraft were being lifted up by a wire, it would be the point at which the wire was attached, and the relationship between the centre of gravity and this point would determine whether the aircraft maintained a level keel as it was being lifted or tipped to right or left or fore and aft.

From the foregoing it should be clear that the principles governing an aeroplane's flight are as follows. With a propeller-driven aircraft the propeller creates a stream of air which supports the aeroplane and its wings, in much the same way that a paper dart is supported in flight by an airstream created by its forward movement. Besides creating a supporting airstream, the propeller screws its way through the air, thereby pulling the aeroplane after it.

This is comparable to the driving of a screw into a piece of wood: the head of the screw moves forward as the spiral of the screw's thread sinks deeper into the wood. As the propeller turns, the air around it is compressed to a higher pressure and it becomes solid enough for the propeller blades to grip it. Some aeroplane propellers are behind the wing; this screwing effect pushes the aeroplane forward, just as turning a screw out of a piece of wood moves the screw-head forward relative to the wood.

Altitude and Forward Speed

With a jet-propelled aircraft a jet of high-pressure air issues from the rear and pushes it forward. This is called reactive force, and is fully explained in Lesson 3. The reactive force of the jet engine pushes the aeroplane forward so that an airstream is created under the wings to support the aircraft.

Because the jet-engined aircraft has no propeller, it is not essential that the air through which it flies should be thick enough for propeller blades to obtain any grip. The rarity-factor of air increases with altitude, and that is why increasing altitude improves the performance of a jet-propelled aircraft—that, and the fact that a reaction engine always operates more efficiently in a rarified atmosphere.

For any given type of aircraft, whether jet-propelled or piston-engined, a certain forward speed is sufficient to produce under the wing a stream of air strong enough to prevent the aeroplane from falling to the ground. Should the forward movement of the aircraft be too slow, the airstream under the wing will not be strong enough to support it and so keep the aeroplane in flight, consequently the machine will quickly lose height.

If the aircraft's forward movement stops altogether, there will not be any airstream under the wings, and the force of gravity will pull the aircraft to the ground, compelling the pilot to glide his machine to earth. This is quite an easy matter, provided the machine is kept balanced on its centre of gravity.

If the forward speed of an aeroplane exceeds a certain figure, the airstream under the wing will be more than enough to prevent its losing height, and the wing will be forced upwards, so causing the aeroplane to climb. But to go faster the pilot must still increase the forward speed of his aircraft.

Increase in speed without increasing altitude is obtained by operating a device called the elevator, which forces the nose of the aeroplane down as the aeroplane's increased forward speed tends to make it climb. By this means the aeroplane can fly at a fixed altitude irrespective of forward speed.

Dihedral angle gives an aircraft lateral stability; the tail-plane ensures horizontal stability; the fin maintains directional stability; the elevators control altitude. Lateral and longitudinal stability constitute an aircraft's equilibrium, and when an aeroplane is flying on a straight course with its wing tips level, it is in equilibrium with its centre of gravity. The design and operation of an aircraft's control surfaces and the various functions they perform are discussed in Lesson 4.

LESSON 2

Types of Aircraft

Heavier-than-air aircraft are of two distinct types; the powered aeroplane and the unpowered glider. Although the control surfaces of a glider are similar to those of a powered aircraft, the factors governing its flight are very different.

Powered heavier-than-air craft are also of two main types: the fixed-wing aeroplane and the rotating-wing aircraft, or helicopter. The fixed-wing aeroplane becomes airborne consequent upon the forward momentum induced by its take-off run along a runway, and on landing it must lose its forward speed by running along the ground after the touch-down.

The rotating-wing aircraft, or helicopter is, in effect, a vertical-lift aircraft; it can take off or land in a vertical direction without the necessity of moving along the ground. For convenience, the fixed-wing aircraft will be referred to throughout these Lessons as an aeroplane, reference to helicopter means a rotating-wing aircraft.

It is common practice to classify aeroplanes into military and non-military types, but this is quite misleading as structurally the two types differ very little except as regards the specific performance for which they are designed. Thus a four-engined bomber is simply a version of a four-engined airliner or vice-versa; just as the jet airliner is merely a version of the jet-engined bomber.

Similarly a single-engined fighter is a version of the single-engined private aeroplane, only faster, more manoeuvrable, and with a higher rate of climb. It is more logical to classify aeroplanes, whether military or civil, as single-engined or multi-engined; jet-propelled or piston-engined; high-wing, mid-wing, or low-wing; swept-wing or delta-wing. All these classes are variations of the monoplane, which has a single wing on each side of the fuselage.

Although the monoplane was a common form of early aircraft, it fell out of favour because of the need for external bracing of its single wing, and because the wing was liable to collapse while the aeroplane was manoeuvring in the air. Consequently the biplane was long generally preferred because the two wings on each side of the fuselage could be braced against each other, so making a very rigid aerofoil.

As engines were developed capable of ever-increasing aircraft speed, it became necessary to design aircraft on improved aerodynamic lines. This meant that the fuselage and wings had to have as few projections as possible, so that as the aircraft moved forward, resistance was reduced.

Fig. 16. HAWKER HUNTER SINGLE-SEAT JET FIGHTER. It has a wing span of 33 ft. 7 ins., and is powered by a Rolls-Royce Avon turbo-jet engine with after-burner. It set up a world speed of 727·6 m.p.h. on September 7, 1953.

Fig. 17. BRISTOL BRITANNIA LONG-RANGE AIR-LINER. Powered by four Bristol Proteus 705 turbo-prop engines each developing 3,780 h.p., it has a wing span of 142 ft. 3 ins., and a length of 124 ft. 3 ins. It has a maximum speed of 386 m.p.h. and a range of 3,450 miles. The Britannia went into service with B.O.A.C. in 1956.

Fig. 18. LOCKHEED SUPER CONSTELLATION AIRLINER. This U.S aircraft first flew a scheduled service in 1952. It was powered by four Wright Cyclone piston engines each developing 2,700 h.p., had a maximum speed of 320 m.p.h., and accommodated 92 passengers. A later version, projected for service in 1957, was powered by four turbo-jet engines.

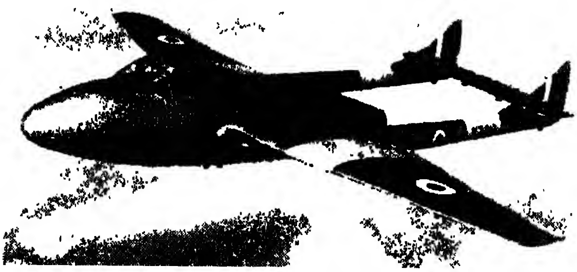


Fig. 19. DE HAVILLAND VAMPIRE TRAINER. Powered by a Goblin jet engine developing 3,500 lb. static thrust, it has a speed of 549 m.p.h., and was designed for the specialised training of jet fighter pilots. It has a wing span of 38 ft. and is 36 ft. 6½ ins. long.

The monoplane offered much less resistance to the air than a biplane. It was further established that an aeroplane with a single wing was actually more stable and airworthy than a biplane. With one or two exceptions in the field of light civil aircraft, the monoplane has become standard wing design, whether for single-engined or multi-engined aeroplanes, and whether jet-propelled or propeller-driven.

A typical single-engined monoplane is illustrated in Fig. 16. The aeroplane has swept-back wings, and because of the absence of propellers the fuselage, mounted on its tricycle undercarriage, is relatively close to the ground on landing. The tail-plane is mounted on the rudder some distance above the end of the fuselage so that it clears the jet exhaust.

The pilot has exceptional all-round view as the cockpit is well forward of the wing, which is thick at the roots to accommodate the engine air-intakes. Like most mid-20th century aeroplanes, the machine has an undercarriage which is retractable in flight.

Fig. 17 shows a low-wing four-engined propeller-driven monoplane with single fin and rudder. A variation of this type of aircraft is the low-wing four-engined monoplane with a triple fin and rudder shown in Fig. 18. Twin and triple fin and rudder assemblies on multi-engined aircraft are designed to improve controllability in the event of one of the engines failing. If a four-engined aircraft is flying on three engines or a two-engined aircraft is flying on one engine, the air stream flowing over the wing to the tail-plane tends to take a bias and make the aeroplane difficult to control.

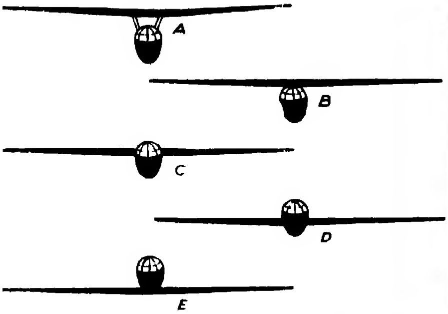
Some designers believe that this bias is easier to correct with a multiple fin and rudder assembly. But this belief is by no means established as an aerodynamic principle. Many large multi-engined aeroplanes have a single fin and rudder, whereas there are many small single-engined aeroplanes with twin fins and rudders, as on the aeroplane shown in Fig. 19. Similarly there are twin-engined aeroplanes with single fin and rudder (Fig 20).

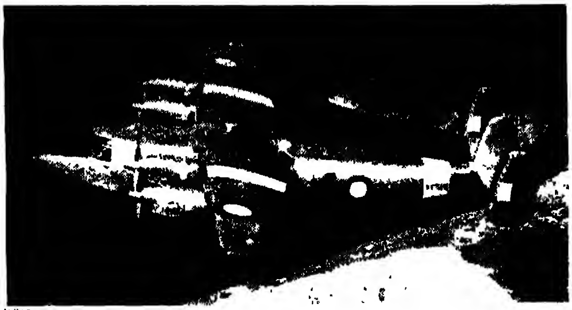
Wing Positions

An important variation in the pattern of aircraft types concerns wing positions (Fig. 21) The aeroplane in Fig. 16 has a mid-wing arrangement. Other aircraft have the wings extended from the top of the fuselage, so that the fuselage appears to hang beneath them (Fig. 22). A third arrangement is the low-wing monoplane (Fig. 17), in which the fuselage appears to rest on top of the wings.

The low-wing monoplane, particularly if it is propeller-driven, is not generally as efficient aerodynamically as the mid-wing, because the air stream is more disturbed with either the low-wing or the high-wing arrangement. Small, single-engined aeroplanes, of the type shown in

Fig. 20. BRISTOL TYPE 170 MK. 31 FREIGHTER. A high-wing cargo-carrying aircraft, it is powered by two Bristol Hercules radial piston engines each developing 2,000 h.p. to give a speed of 225 m.p.h. and a range of 820 miles. The 73-ft. fuselage accommodates several tons of cargo which is loaded through twin doors in the nose, opening to the width of the fuselage.





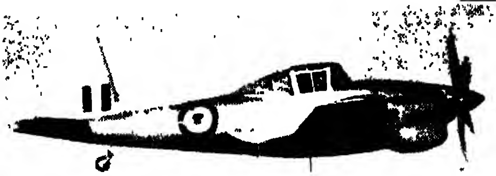


Fig. 21 (top left). WING POSITIONS. A, parasol; B, high wing; C, medium high wing; D, mid-wing; E, low wing.

Fig. 22 (above). HANDLEY PAGE MARATHON. A high-wing aircraft designed for commercial transport, converted for training R.A.F. navigators. Each of the four De Havilland Gypsy Queen engines develops 340 h.p.

Fig. 23 (left). BOULTON PAUL BALLIOL MK. 2 TRAINER. A low-wing twin-seat aircraft. It is powered by a Rolls-Royce Merlin 35 piston engine which develops 1,280 h.p.

Fig. 23, favour the low wing because it is convenient for accommodating the wheels and struts of the retractable undercarriage. The wing position is not generally so important with jet aircraft, although the mid-wing and the low-wing are more favoured. The advantages and disadvantages of the three wing positions are more fully discussed in Lesson 4.

Engine Mountings

British-designed jet-engined aircraft invariably mount their power units flush in the wing (Fig. 16), so preserving for the latter a clean aerodynamic shape. Many American-designed jet aircraft mount their engines in nacelles or "pods" slung below the wing (Fig. 25). Piston-engined and turbo-propeller aircraft mount their power units below the wing (Fig. 20); across the wing (Fig. 17); or on top of the wing (Fig. 24).

Wing Shapes

Wings of piston-engined aircraft were, in general, variations of the square-end and tapered aerofoil, but with the development of jet propulsion it became necessary to design wings which would be more efficient for the greater speeds and higher altitudes that became possible with the new power units. Accordingly, many revolutionary wing shapes were designed, including the swept-back, the delta, and the crescent (Fig. 26). The aerodynamic principle on which these wings are designed and their relative efficiencies are discussed in Lesson 4.

A flying-boat is, in effect, a ship-like hull with wings. Hull and fuselage form a single structure. There is no undercarriage;

Fig. 24 (above). CONVAIR TRADEWIND. A high-wing flying-boat designed as an assault-transport for the U.S. Navy. It is powered by four Allison T.40 turbo-prop. engines each developing 5,500 h.p. to give a maximum speed of 350 m.p.h. and a range of 4,000 miles.

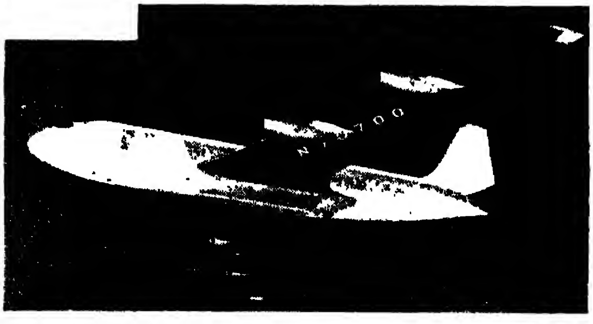


Fig. 25 (right). BOEING 707 MILITARY TRANSPORT. The first jet-engined transport aircraft built in the U.S.A., it went into service in 1954, powered by four Pratt and Whitney jet engines. The maximum speed is 550 m.p.h.

the craft alights on, and takes off from water, on its hull. The seaplane is an aeroplane with twin floats instead of a wheeled undercarriage, and it also alights on, and takes off from, water.

The advantage of flying-boats and seaplanes is that they do not require expensive airfields to operate from, and can land on, and take off from, any stretch of fairly smooth water. Fig. 27 shows a typical flying-boat.

At one time it was thought that the flying-boat would become the logical answer to the problem of transporting heavy loads for long distances on trans-ocean air routes, particularly as there would be less risk of total loss in the event of the aircraft's being forced down into the sea. But the development of reliable power units has greatly reduced the incidence of engine failure. The heavy, boat-like hull of the flying-boat constitutes a far from efficient aerofoil, so that it is inevitably a much slower aircraft than the land-plane, and consequently it is much less manoeuvrable.

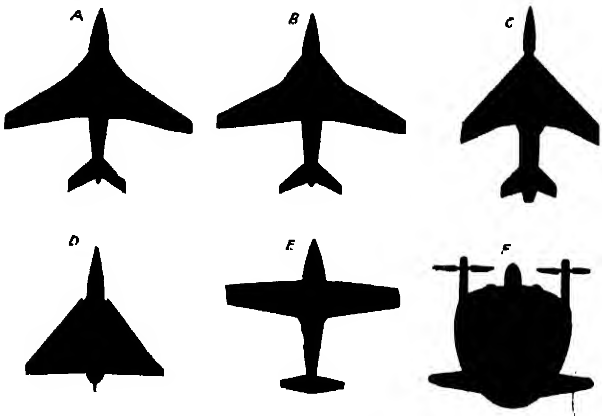


Fig. 26. WING SHAPES. A, scimitar ; B, semi-scimitar; C, swept-back; D, delta; E, square wing; F, circular-zimmerman. The latter was an experimental wing shape designed for the U.S. Navy in 1947.

A compromise between the flying-boat and the land-plane is the amphibian (Fig. 28). This type of aircraft has a flying-boat hull for operations on water, and retractable wheels for operations as a land-plane. The ratio of an amphibian's size to its weight renders it inconvenient except for certain specialised duties.

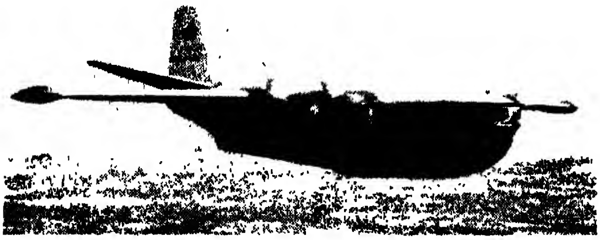


Fig. 27. SAUNDERS-ROE PRINCESS FLYING-BOAT. Designed as a commercial transport, this 147-ton flying-boat is powered by 10 Bristol Proteus turbo-propeller engines : eight arranged in coupled pairs, two mounted singly.

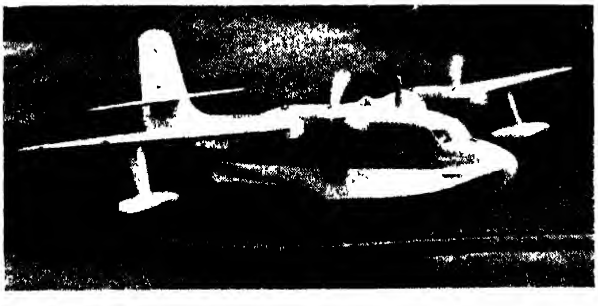


Fig. 28. SHORT SEALAND AMPHIBIAN. On this compromise between the flying-boat and the land-plane, the landing wheels rise into the hull when the aircraft operates on water. The high wing carries two D.H. Gypsy Queen piston engines each developing 340 h.p. Wing span is 61 ft. 6 ins.

Gliders

A glider is a fixed wing, non-powered, heavier-than-air craft ; and, as its name suggests, its navigation is restricted to comparatively short flights, with limited manoeuvrability. From the glider developed the sailplane, which has greater range and considerable manoeuvrability. Both these aircraft remain airborne by virtue of being piloted into regions where the air flow over hills or other ground obstructions creates upward currents of air to give them lift.

Gliders and sailplanes have no place in commercial aviation, and their principal use is for sport, although in the Second World War they were extensively used for airborne military operations. The principle of the glider and sailplane and the method of flying them are discussed in Lesson 14.

Rotating Wing

A rotating-wing aircraft is designed to lift itself vertically into the air without any preparatory run along the ground. There are two types : the "Autogiro" and the helicopter. In both the fixed wing is replaced by a three-bladed rotor which performs the dual functions of giving the aircraft lift and inducing forward motion.

In the "Autogiro" the rotor is driven by the engine until the machine reaches flying altitude, when the engine is switched off and clutched into a propeller in the nose of the fuselage. The forward motion of the aircraft then causes the rotor to revolve freely in the horizontal plane so that it acts as a wing and is supported by the airstream from the engine-driven propeller.

The helicopter's rotor is power-driven both for take-off and for flight. Direction of flight and changes in altitude are controlled by altering the angle at which the rotor blades meet the airstream. The "Autogiro" has been abandoned for all practical purposes, and development of rotating-wing aircraft has been concentrated on helicopters, some of which have jet-powered rotors.

Rotating-wing aircraft are much slower than the orthodox aeroplane with fixed wings. An attempt to combine the speed of the fixed-wing aeroplane with the vertical lift of the rotating-wing aircraft is the "rotodyne." This machine has a rotor driven by compressed air from a turbine in the fuselage to give vertical lift. In forward flight, propulsion is by turbo-propeller engines mounted below the wings. Rotating-wing aircraft are discussed in detail in Lesson 7.

LESSON 3

Aircraft Power Units

THERE are three principal types of power unit for aircraft . the piston engine, driving a propeller : reaction engines, such as rocket and jets, which do not drive propellers but give the aircraft forward motion by the thrust of a stream of high-pressure gases issuing from the rear of the engine , and the turbo-propeller engine, in which the shaft of a gas turbine drives a propeller

Piston engines are further divided, according to the arrangement of their cylinders, into radial and line engines; the former are air-cooled and the latter liquid cooled. There are also subdivisions of line and radial engines

Reaction engines, or jet drive, fall into four main categories ; rocket, ram-jet, pulse-jet, and turbo-jet. The first three can be ignored, for although they are the simplest types of jet engines they have many limitations, the chief being their extravagant fuel consumption and short endurance for a practicable weight of fuel. This latter is the overriding consideration for their rejection as aero power units except for a few specified types of military aircraft.

The turbo-jet engine, because of its comparatively simple construction, lack of moving parts to create wear and tear, and low power-for-weight ratio, is rapidly displacing the piston engine for military aircraft and is becoming a serious rival of the piston engine for fast long-distance commercial aeroplanes. The turbo-propeller engine has two categories ; in one the shaft of the gas turbine drives a propeller ; in the other their exhaust gases eject through a rear duct to assist the work of the propeller.

As explained in Lesson 1, forward velocity of an aircraft creates the lift that keeps the aeroplane in the air, and the prime function of an aircraft engine is to induce forward velocity. At the same time, an aeroplane's power plant must give it motion, just as any other vehicle must be given motion.

But there the similarity between the source of motion of an aeroplane and that of a land or marine vehicle ends. Increasing the power of an engine increases its weight and also the weight of the fuel from which it derives its energy. Increasing the weight of the motive power of a surface vehicle does not necessarily mean a reduction in the weight of its payload ; but it does in an aeroplane, because an aeroplane has to carry the weight of its payload and power plant in sustenation.

In other words, an increase in weight for a given power of an aero-engine necessitates the generation of more lift to support the aeroplane and its engine ; this in turn necessitates increased power, and therefore a heavier engine and a greater fuel consumption.

In proportion to its laden weight, an aircraft's payload is very small, being in the ratio of about seven to one Most of the non-payload weight of an aeroplane is accounted for by engines and fuel. A seven to one, or even lower, ratio of laden weight to payload is not of supreme importance to military aircraft, such as bombers, which are designed to deliver a given weight of bombs over a given distance and then return, and do not have to pay their way or show a profit on their operation But with commercial aircraft payload is the overriding factor, because upon payload depends the economic efficiency of commercial aviation

Weight and Power

The chief concern of the aero-engine designer is to keep down weight without sacrificing power. But the minimum weight for maximum power must allow for the weight of both the engine and the fuel that has to be carried to feed it. The importance of total weight of engine and fuel is illustrated by the rocket motor.

This type of power unit is of itself exceptionally light, but the most successful rocket motor

yet installed in an aircraft burns a ton of fuel a minute. Conversely, there are some relatively heavy piston engines with very low fuel-consumption, and these have advantage where long range at moderate speed is required. Where flight is of several hours' duration, low fuel-consumption, and therefore the weight of the fuel supply carried, becomes more important than the weight of the actual engine.

When the Wright brothers achieved the distinction of making the first flight with a man-carrying heavier-than-air craft in 1903, the piston engine they used developed one horse-power for every 15 lb. of the weight. Fifty years later, basically similar aero-engines were developing one horse-power for little more than one pound of engine weight. Even more remarkable was the reduction in the power-for-weight ratio of the gas-turbine driving a propeller—one horse-power for every four-fifths of a pound of engine weight.

No less important than the power-for-weight ratio of an aero-engine are its shape and method of mounting. Besides adding to the total weight of an aircraft, the engine raises the drag factor because it increases the aircraft's frontal area. Hence the tendency to favour the in-line rather than the radial piston engine.

Wherever possible, the line engine is fixed into the fuselage or wing, while engine components are accommodated to its rear. The design of an efficient aero-engine must always take into account the horse-power lost for each additional square foot of frontal area.

Horse-Power and Thrust

Power of a piston aero-engine is expressed in horse-power, and one horse-power is defined as the power that will lift a weight of 550 lb. a distance of one foot in one second. According to this definition, an engine developing 300 h.p. would theoretically lift 550 lb. a distance of 300 feet every second, that is, it would be capable of a speed of approximately 200 m.p.h. In practice performance would be much lower because of friction and other mechanical losses. Reducing the speed at which weight is lifted increases the load that can be lifted. A lift of 1,000 pounds would be done at 30 m.p.h.

Output or power of a turbo-jet engine is not measured in horse-power but by the thrust exerted against the outer air by the mass of compressed air or gas ejected from the nozzle at the rear of the power unit; and it is expressed in thrust-pounds. To understand thrust-pounds it is necessary to appreciate the mechanical processes that create them in a turbo-jet power unit.

In a turbo-jet engine, air is scooped or rammed into the front opening of a duct by

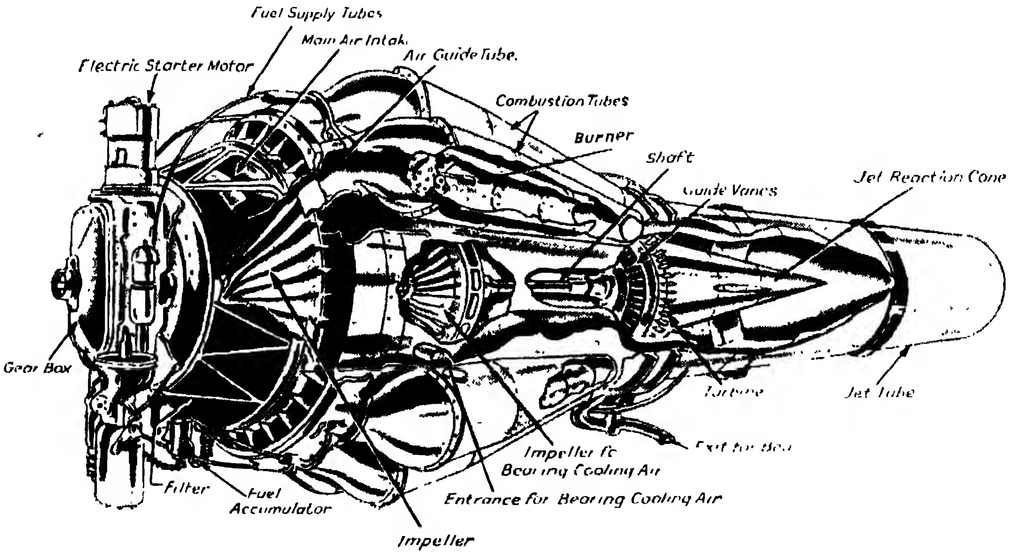


Fig. 29. JET ENGINE. An electric starter-motor turns the blades of the impeller which draws in and compresses air which is forced into the combustion tubes. Each tube has a jet through which a spray of paraffin burns, causing the highly compressed air to expand quickly, and force its way out through nozzles against the blades of the turbine. Turbine and impeller being mounted on a common shaft, the engine is self-acting. After passing the turbine blades, the air and paraffin mixture is forced to the rear of the engine and reacts against the cone, causing the engine and the aircraft in which it is fitted to move forward. A jet engine creates inside itself great heat, and to prevent the parts from becoming too hot a small impeller draws air through ducts into the engine. The cooling air then passes out through vents.

the forward velocity of the aircraft on which it is mounted, and is then forced by a mechanical compressor into a combustion chamber. The compressor is driven by a turbine. Kerosene is pumped into the compressed air at a pressure of 750 lb. per square inch through an atomiser and burnt continuously, on much the same principle as that of a plumber's blow lamp.

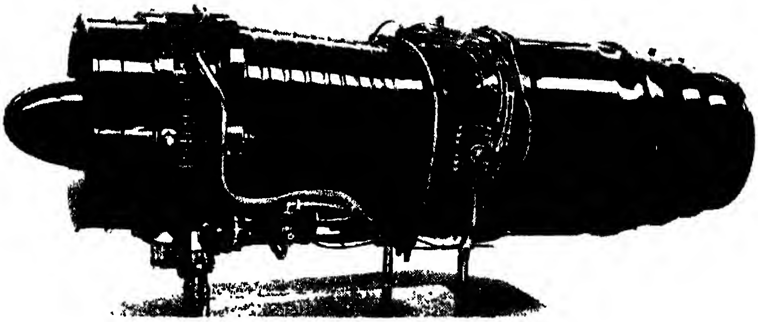


Fig. 30. ARMSTRONG SIDDELEY SAPPHIRE AXIAL FLOW TURBO-JET ENGINE. Eleven feet long, and 3 ft. 1 in. in diameter, the Sapphire weighs 1 ton 3 cwt. 24 lb. and develops a static thrust of 8,000 lb.

The proportion of air to fuel necessary for efficient combustion is in the ratio of 14 parts air to one part of fuel, but the overall ratio is in practice approximately 60 to 1. The excess air serves as a dilutant to lower the temperature of the combustion chamber from 1,800° C. to approximately 800° C. This last is the approximate limit which the turbine blades can withstand without damage. The problem of suitable materials for turbine propeller blades is discussed in Lesson 6.

Some of the kinetic energy of the gases issuing from the combustion chamber is converted into mechanical energy by the turbine. In forcing an exit past the aerofoil section blades, the turbine wheel is rotated at speeds in the range of 10,000–16,000 revolutions a minute to drive the compressor to feed in more air and so maintain continuity of operation.

The expansion of the gases in the turbine continues in the tail-pipe leading to the nozzle. The gases leave the nozzle at lowered temperature and pressure but at greatly increased velocity – between 1,000–1,200 m.p.h.

Thrust and Horse-Power

At a rough approximation, each 50 lb. of propulsive thrust requires an intake of 1 lb. of air per second, and for each pound of air per second 100 h.p. is needed to drive the compressor. Consequently a jet unit developing 2,000 lb. thrust requires a turbine of 4,000 h.p. to drive its compressor. Fig. 29 illustrates in simplified form the cycle of operation of a turbo-jet engine, and Fig. 30 shows a type of turbo-jet engine used on high-speed aircraft.

Thrust of a jet engine can be converted into horse-power for comparison with piston-engine output provided the forward speed of the jet-propelled aircraft is known. Thrust multiplied by aircraft speed gives miles-pounds per hour, which is converted into foot-pounds per minute and thence into horse-power. At an aircraft speed of 375 m.p.h. one pound of thrust equals one thrust-horse-power (t.h.p.).

Thrust is calculated from the standard equation defining a force:

$$F = \text{Mass} \times \text{Acceleration},$$

so that thrust (T) of a jet engine can be equated as

$$T = \frac{\text{Mass} \times \text{Increase of Velocity}}{g}$$

where g is gravity.

Thrust of a jet engine is at maximum when the aircraft in which it is installed is stationary and, theoretically, should fall to zero when the aircraft speed equals the velocity of the jet stream. In practice, however, the compression of the air sucked into a jet engine increases with forward speed, so that thrust starts to rise after an aircraft speed in the 200-m.p.h. range, and in the 600-m.p.h. range is equivalent to static thrust; thereafter thrust continues to rise. Thrust-horse-power is expressed thus:

$$\text{t.h.p.} = \frac{\text{Thrust} \times \text{Aircraft Speed}}{375}$$

Calculated from a theoretical thrust curve, thrust-horse-power rises from zero when the aircraft is stationary to a maximum when the aircraft speed is half the jet velocity, and falls to zero when aircraft speed rises to that of jet velocity. In practice, thrust-horse-power under the influence of ram-compression rises steadily and continuously from zero when the aircraft is stationary.

Propulsive efficiency is governed by the ratio of jet velocity to aircraft speed. It is zero when the engine is stationary and 100 per cent. when aircraft speed equals jet velocity. Given the ratio R, propulsive efficiency π is determined by the equation

$$\pi = \frac{2}{R + 1}$$

and will be 50 per cent. at a ratio of 3 : 1, 66·6 per cent. at 2 : 1, and 80 per cent. at 1·5 : 1.

This contrasts remarkably with the efficiency of a propeller driven by a piston engine which, very approximately, falls from 80 per cent. at

400 m.p.h. to 60 per cent. at 600 m.p.h. This drop in airscrew efficiency explains why the jet engine is a far more practicable power unit for aircraft designed to operate at speeds exceeding 400 m.p.h.

Cooling

As stated at the beginning of this Lesson, the two chief types of aero piston engine are the radial and the in-line; the chief distinction between them is in the method of cooling.

All cooling is, in the last instance, air cooling; but the name "liquid-cooled" is by custom applied to those in-line engines which interpose a secondary stage of heat between the point where it is generated and where it is transferred to the air. The engine cylinder barrel needs cooling, and in the air-cooled engine the cylinders are mounted radially around the propeller shaft and provided with fins, which give them a large area over which the heat disperses itself and from which it can be absorbed by air passing over the fins.

In the liquid-cooled engine the cylinder barrel, instead of having fins, is encased in a jacket within which the liquid is circulated. The liquid takes up the heat and carries it to a radiator, whence it is dispersed to the air.

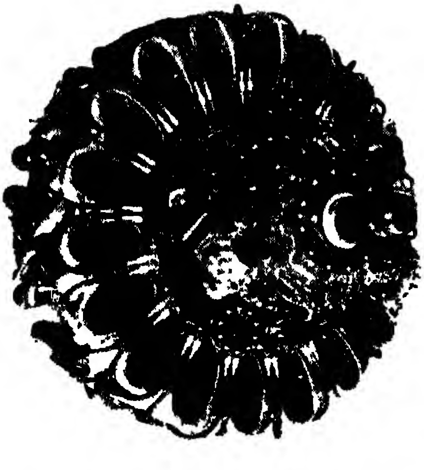
The cooling liquid can be water, but in practice is ethylene glycol or some similar substance that has a higher boiling point than water. Although air cooling is more simple, the liquid-cooled in-line engine is aerodynamically cleaner and gives the aeroplane designer greater latitude in the arrangement of the engine cylinders. Instead of having to dispose them so that the air passes equally over them all, the designer can circulate the cooling liquid around the cylinder barrels.

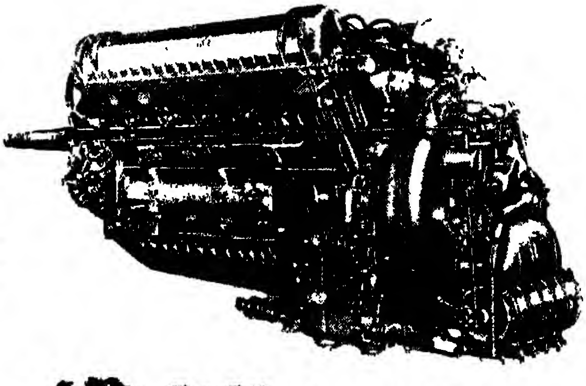
Another advantage is improved control over the cooling. The final transfer of the heat to the air is by means of a radiator, which can be conveniently disposed in any part of the aeroplane and which can be enclosed in a duct provided with a controllable flap for regulating the flow.

Designers of radials have done much to improve air-cooled engines by enclosing them in cowls and fitting gills. The former reduce drag and the latter give more control over cooling. Fig. 31 shows a typical air-cooled radial engine and Figs 32 and 33 are examples of the liquid-cooled in-line type.

Supercharging

One of the most important developments in the aero piston engine has been towards increasing its efficiency for high-altitude flying. The charge must be forced into the cylinders at a high boost if the "thinness" of the air (and





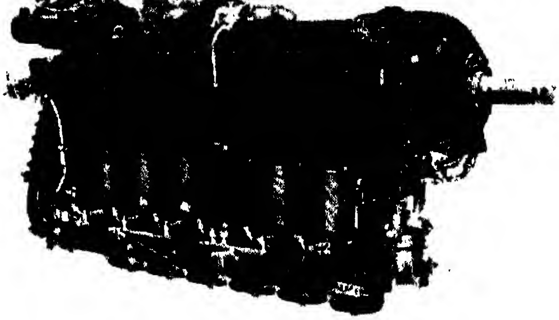


Fig. 31 (above). Bristol Centaurus Radial Piston Engine. Weighing 1¼ tons, it has 18 cylinders arranged in two rows, is 4 ft. 7 ins. in diameter, and develops 2,705 h.p. Fig. 32 (top right). Rolls-Royce Griffon 57 In-line Piston Engine. Weighing 19 cwt., it has 12 cylinders and develops 2,500 h.p. Fig. 33 (right). De Havilland Gypsy Queen 70 Mk. 2. In-line Piston Engine. The engine is air-cooled by scoops which collect air and pass it over the cylinders and heads. It is 5 ft. long, weighs 4 cwt. 77 lb., and develops 240 h.p.

low proportion of oxygen) at height is to be compensated. This can be done by a two-stage, two-speed supercharger and intercooler.

The mixture of fuel and air is compressed by the first supercharger impeller, and is then passed to the next impeller, which compresses it still further. These two stages of compression increase the temperature of the charge (for increases in pressure produce increases in temperature), and in order to ensure that a full weight of charge is introduced into the cylinders, the temperature must be lowered again. This is done by the intercooler, a form of radiator which also passes its heat to the air as in an ordinary radiator, though quite separate from the ordinary engine radiator.

An alternative method is to use an exhaust-driven turbo-blower. This is a turbine driven by the exhaust gases from the engine, which also drives a supercharger. The turbo-blower has been applied to both air-cooled and liquid-cooled engines.

Piston engines have been built to give an output exceeding 3,000 h.p. and further development might have culminated in piston engines of 8,000 h.p., which is considered the ultimate power limit of the piston engine and the limit to which an airscrew driven by it would be efficient. But before either of these limits was within measurable distance of achievement, jet propulsion revolutionised all previous conception of aero-engine speed, power, and performance.

By-Pass Engine

Two important developments of the turbo-jet power unit are the Conway by-pass and the ducted fan. The Conway by-pass engine was originally designed for the Vickers 1000, a four-engined military transport projected for the R.A.F. in 1953, and was an important step towards reducing the high fuel consumption of the orthodox turbo-jet engine.

In a by-pass engine only a proportion of the air sucked into the engine is compressed and heated. The remainder by-passes the combustion system and turbine and joins the heated gases in the jet pipe to mix with them and lower their temperature before the whole mixture is ejected at a lower velocity than in the conventional jet engine.

Lower velocity of jet discharge gives higher propulsive efficiency resulting in lower fuel consumption for any given thrust. The by-pass has the incidental, but very important, effect of reducing the noise of the jet exhaust. Fig 34 shows the theoretical layout of a by-pass engine, and Fig 35 shows its practical application in an operational engine.

Basically a ducted-fan engine is a turbo-jet which has its turbine blades lengthened to extend outside the engine casing. Air flowing

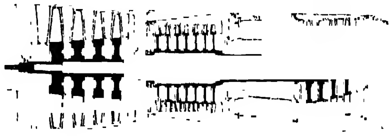


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Fig. 34. Theoretical diagram of a by-pass gas turbine. It is in effect a free-turbine turbo-prop. with many small blades and a large, low-pressure compressor.

over the engine during aircraft flight is trapped by the turbine-blade extensions and forced through a duct to the rear at accelerated speed in much the same way as is the air passing through an ordinary airscrew.

The ducted-fan engine has a greater mass flow than has the orthodox turbo-jet and, as it reduces mean jet-velocity, increases propulsive efficiency. Moreover, as the blade-tip velocity of a ducted fan is somewhat less than that of an airscrew transmitting comparable power, the efficiency of the ducted fan component increases with a rising speed. By shaping the duct like a diffuser, a pressure rise is created in front of the blading, so reducing flow velocity. Fig 36 shows diagrammatically a ducted-fan component.

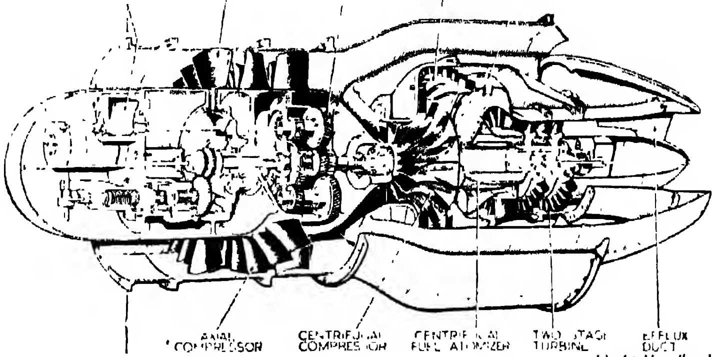

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Fig. 35. FURBOMECA ASPIN II BY-PASS JET ENGINE. The bulk of the air delivered by the single-stage axial compressor is by-passed, so that only a small proportion goes to the centrifugal compressor which feeds the combustion chambers and turbine. Made in France, the Aspin II is 5 ft. long, weighs 3 cwt., and develops a static thrust of 672 lb.

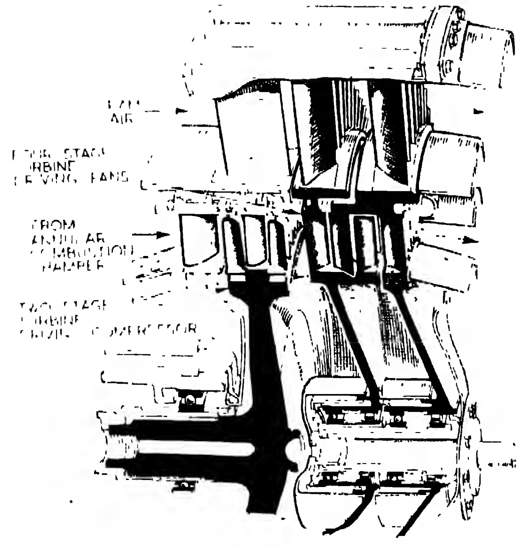

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Fig. 36. Section of the Metrovick F.3 ducted-fan jet engine, showing the intermeshed double-decker blading.

A turbo-jet, or to give it its technically correct name, a gas-turbine engine, can propel an aircraft in one of two ways ; by straight jet propulsion or by transmitting its power to an airscrew. When the gas turbine has to revolve an airscrew as well as drive a compressor, the shaft on which the turbine and compressor are mounted is extended forward to accommodate an airscrew. The extension is made through a gear box to reduce the high turbine speed to a speed practicable for an airscrew.

Some turbo-propeller engines have a turbine to drive the compressor and a second turbine to drive the propeller. This requires a hollow shaft for turbine and compressor. Through it passes a second shaft transmitting power from the rear turbine which drives the propeller through a reduction gear.

With a turbo-propeller engine, the bulk of the energy from the gases is converted into shaft-power to drive the compressor and airscrew. The residue of the energy from the gases is ejected from the rear nozzle and so contributes to the engine's total propulsive effort.

Sometimes two jet units are mounted side by side and geared to a co-axial shaft, that is, one shaft running inside the other, on which are mounted two airscrews. The advantage of this (Fig. 37) is that either of the engines can be stopped and its airscrew feathered (*see* Lesson 6), while the other engine continues to run and revolve its airscrew.

Consequently single-engined cruising is possible, and there is the safety factor of a twin-engined aircraft combined with a single-engined layout. It is quite common for an aircraft to cruise on half its maximum engine power, but this cannot be done efficiently with the orthodox turbo-jet unit, the fuel consumption of which becomes uneconomic when it is not operating at its maximum power.

A turbo-propeller engine is usually described as developing a specific shaft-horse-power (s.h.p.) plus a specific thrust. Conversely, thrust can be converted into horse-power, as previously explained, and added to the shaft-horse-power. The figure so obtained is called equivalent-horse-power (e.h.p.).

Piston engines can develop over 3,000 horse-power on a consumption of one half-pound of fuel per horse-power per hour, and run continuously for approximately 1,000 hours between overhauls. Both the pure jet engine and the turbo-jet engine equal the piston engine in endurance and far surpass it in the propulsive power developed. But the two types of jet engine differ greatly in fuel consumption.

Fuel consumption of a pure turbo-jet engine is approximately double that of a comparable piston engine. This difference would be negligible in operational practice if the turbo-jet did twice the amount of work by flying twice as fast as the piston-engined aircraft. But, in fact, an increase in cruising speed exceeding approximately 400 m.p.h. does not bring about a commensurate gain in average aircraft journey-time.

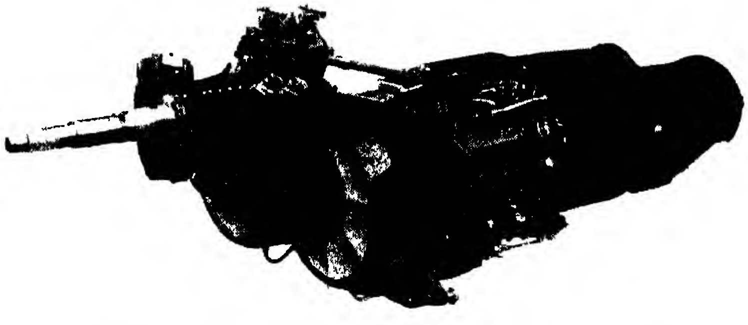


Fig. 37. ARMSTRONG-SIDDELEY DOUBLE MAMBA. This engine is an assembly of two jet units mounted side by side and driving two contra-rotating airscrews mounted on a common shaft. Each engine can be started, stopped, cruised, or feathered entirely separate from the other. The combined engines weigh just under one ton and together develop 2,640 shaft-horse-power plus 810 lb. static jet thrust.

In order to reduce fuel consumption to a minimum, the pure turbo-jet commercial aircraft must fly high, and is in operational practice limited to a narrow band of altitudes fringing on the stratosphere. At such altitudes high wind velocities make close timekeeping difficult at all seasons of the year on certain routes, such as across the North Atlantic.

Because it uses a highly efficient airscrew, the turbo-propeller engine largely solves the fuel problem posed by the pure turbo-jet engine. Moreover, an airliner powered by turbo-propeller engines can cruise economically at any altitude in the 15,000 35,000 feet range, and by flying at the appropriate altitude can take advantage of prevailing tail winds and minimise the resistance effect of head winds.

A turbo-propeller engine developing 4,000 horse-power is considerably more powerful than the most powerful piston engine, and although its fuel consumption is ten per cent greater, this is more than compensated for by the fact that jet engines use kerosene, which is a much cheaper fuel than high-quality petrol.

LESSON 4

Aircraft Wings and Control Surfaces

An aeroplane is supported and stabilised in flight by three fixed surfaces; the wings, the fin, and the tail-planes And it is manoeuvred and controlled in flight by three movable surfaces: the rudder, the elevators, and the ailerons. The movable surfaces are all hinged extensions of fixed surfaces and are operated by the pilot through manual or power-assisted linkages.

There are several other fixed or movable surfaces, such as slots, flaps, and wing-fences, which, although now standard on many aeroplanes, are in fact refinements making flying easier and safer; an aeroplane would be airworthy without them, but the six basic surfaces first mentioned are essential to aeroplane flight. The positions of an aeroplane's fixed and movable surfaces are shown in Fig 38

Function of Wing

As explained in Lesson 1, the function of the wing is to support the aeroplane in flight, and this is done by taking advantage of the airstream created under it by the forward motion of the aircraft. At the same time the forward motion of the aircraft lowers the pressure of the air immediately above the wing, and this creates a sucking effect which tends to hold up the wing.

Incidentally, an aircraft is very partially supported in flight by an increased pressure of the air underneath it pressing on the ground above which it is flying. Normally this pressure is insignificant, but a sensitive barometer will register at ground level a difference of air pressure when a large aircraft passes low overhead.

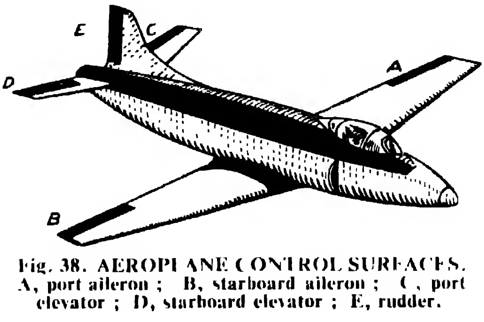


Fig. 38. AEROPLANE CONTROL SURFACES. A, port aileron; B, starboard aileron; C, port elevator; D, starboard elevator; E, rudder.

During the early days of aeroplane flight, wings were made the same width from root to tip, but various shapes have been introduced and the lateral angle of wing to fuselage is varied. Such shapes and angle variations are made either to reduce air disturbances on wing surfaces, to increase aircraft speed and improve manoeuvrability, or to make it possible for an aircraft to fly efficiently at high altitudes where the thinness of the air offers less support for a wing In this Lesson only the single-winged aircraft or monoplane is discussed, as the multi-winged aeroplane is obsolescent

Wing efficiency is governed by the lift it gives the aircraft in relation to the drag or resistance it has to overcome, and can be expressed as a fraction:

$$\frac{\text{Lift}}{\text{Drag}} \quad \frac{L}{D}$$

This fraction is not a constant for any wing, but varies according to the angle of incidence, i.e the angle at which the wing meets the air coming to it

The lift of a wing varies considerably with the angle of incidence, and with an ordinary cambered wing does not fall to zero until the incidence becomes a few degrees minus. The actual figure varies according to the degree of camber, or amount of curvature of the wing's centre line. From zero the lift of the wing increases until it reaches a positive angle of incidence, when it begins to fall off again.

The angle of incidence at which a wing's lift begins to fall off is called the stalling angle,

and it is a critical point in the aeroplane's stability because of the change of air flow that takes place around the wing. Instead of flowing steadily and smoothly over the upper surface of the wing, the air breaks away, leaving a space above the wing which is full of eddies, vortices, and other disturbances.

When the wing loses lift, the machine tends to go into a stall. A well-designed aeroplane will generally right itself after a stall provided it has sufficient time and altitude. But if it stalls at a low altitude, disaster can result. The problem of preventing a stall is really that of preventing the air from breaking away from the top of the wing so that a smooth air flow can be maintained over the wing surface.

One way of doing this is to fit a slot in front of the leading edge of the wing. The slot is shaped rather like a wing section, and its effect is to guide a stream of air over the rear of the plane. The slot opens automatically because at the stalling angle of the wing air is forced against it.

The lifting force of a wing is concentrated more towards the leading edge and gradually falls to zero at the trailing edge. Moreover, only about one-third of the lifting force is caused by increased pressure on the lower surface of the wing; the remainder is accounted for by decreased pressure on top of the wing. This distribution of lift is not constant but varies with the angle of incidence, being increased as incidence is increased and decreased as incidence is decreased. At a very low angle of incidence the lifting force of a wing is somewhat behind its centre section

Functions of Tail-plane

The variation in the concentration of the lifting force of a wing and its distribution according to the angle of incidence combine to make the wing by itself inherently unstable. This is because an increased angle of incidence pushes the air pressure forward on the wing, so increasing the angle of incidence still further; conversely, a reduced angle of incidence pulls the pressure back on the wing, causing the angle of incidence to become still smaller.

If an aeroplane of orthodox wing shape but without a tail attempted to fly, the slightest irregularity in air flow would vary the angle of incidence of the wing. If the angle of incidence were reduced, the backward shift of the centre of pressure would cause the aircraft to go into an uncontrollable nose-dive; similar effect in the reverse direction, that is, an increase in the angle of incidence, would cause the aircraft to put its nose up and go down in an uncontrollable tail-spin. Both these conditions are counteracted by the fixed surface called the tail-plane.

When a condition occurs in flight to reduce the angle of incidence, the centre of pressure goes back and the aeroplane tends to dive. But this action immediately creates an air stream that raises the tail to give it a negative angle of incidence; whereupon there is a downward pressure on the tail which overcomes the diving tendency of the wing and the aeroplane is returned to a level keel. Should the wing's angle of incidence be increased, pressure is created under the tail, which is forced up to correct the upward movement of the wing which otherwise would result in a tail spin.

Another function of the tail-plane is to keep the aeroplane stable in horizontal flight; that is, to provide the compensating forces necessary to adjust unwanted fore-and-aft movements when the centre of pressure on the wing and the centre of gravity of the aircraft as a whole do not coincide. Without the tail-plane any movement of the load in an aircraft, even a passenger changing his seat, would alter the centre of gravity.

Similarly, changes in aircraft speed cause a movement of the centre of pressure on the wing, and a consequent alteration in the angle of incidence. As already explained, such movement tends to throw the aeroplane off an even keel, but is automatically corrected by the tail-plane

Function of Fin

The fin does for the fuselage what the tail-plane does for the wing. Lift is not necessarily upwards from the ground, but is a force acting at right angles to the air stream; in other words, lift can be lateral as well as vertical. An aircraft flying in conditions where the air disturbances were such that the wind was slightly yawed with respect to the aeroplane would have a slight angle of incidence sideways.

It would thereupon be subjected to a sideways force which would tend to be concentrated towards the nose Were it not for the immediate correction of the fin, the aeroplane would immediately swing round and so increase the sideways force, and would go on turning until the movement became uncontrollable.

Any tendency towards such lateral movement is halted by the fin in the same way that the tail-plane prevents unwanted deviation from the horizontal. When it has a suitable angle of attack, as when the fuselage of the aeroplane tends to swing from its lateral axis, the fin generates lift in a transverse direction. Should the rear of the aircraft yaw to the left, the fin will have the correct angle of attack to induce a lift acting towards the right. If the yaw is to the right, the fin compensates the movement by developing lift to the left.

One of the most important factors in the efficiency of a wing is its area in relation to the weight of the machine it has to support, and this in turn depends upon the minimum speed at

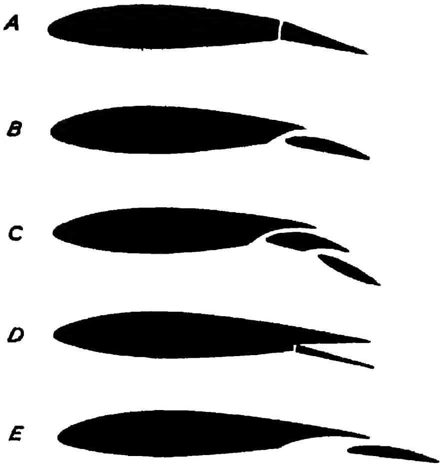


Fig. 39. TYPES OF AEROPLANE FLAP. For explanation of letters, see text in this column.

which the aircraft can fly. Another consideration is that the larger the wing area of an aeroplane is, the greater will be the weight of the wing and the less will be the total aeroplane weight available for useful load, e.g passengers, freight, fuel, etc.

The smaller the wings are in a given size of machine, the faster the aircraft will be, because the resistance it has to overcome at high speeds will be so much the less. At this point a complication immediately arises, for while small wings give high speed in flight they also give a high landing speed ; and this is always undesirable.

Flaps and Slats

A compromise that embodies in one wing small area for high speed in flight and large area for low landing speed and maximum take-off lift is provided by the use of trailing edge flaps and leading edge slats. A flap is a hinged surface on the trailing edge of the wing which can be lowered to form an angle with the lower surface of the wing.

Flaps are of the five main types, shown in Fig. 39 : (A) plain trailing edge flap, (B) trailing edge flap with a gap between it and the wing structure, (C) flap that forms a double gap or slot between it and the wing structure, (D) split flap, the leading edge of which is hinged some distance forward of the trailing edge of the wing, so that the wing surface is uninterrupted when the flap is lowered, (E) the Fowler flap, which runs to the rear of the wing's trailing edge on guide rails, so that when fully extended it increases both the area and the camber of the wing to which it is attached.

All these types of flap act in the same way. They give to the wing a large angle of attack, so increasing the lift coefficient by deflecting the air flow downward. A larger angle of attack is necessary to get the utmost lift from the wing when an aeroplane is landing. The landing must be made as steady as possible, but the lift being created by the wing must be only slightly less than the weight, so that the sinking or touch-down speed will not be too great. Flaps also create drag, which is the rearward aerodynamic force caused by an aeroplane's forward motion, and therefore act as a brake on landing speed

Methods of Operation

On light aircraft, flaps of the plain or slotted types are fabric-covered and hand-operated by the pilot But on large aircraft the flaps are of metal structure and operated either by hydraulic power or by screw-jacks turned through gearing by electric motors. On fast aircraft, particularly high-speed fighters, split flaps are fitted and are stressed for use as high-speed air brakes. A small gap between their upper edges and the wing allows the pressure to escape.

Slats are mounted on the leading edge of the wing and so arranged that when they come into operation they provide a passage through which the air is caused to flow over the surface of the wing, and so delay the break-away of the boundary layer. The slat can be of two kinds. It can be rigidly fixed at an angle so that there is a permanent gap or slot from the upper surface of the wing's leading edge to the lower surface. In this way the lower opening of the gap is farther forward than the upper opening

It is more common practice to have the slat so mounted that the gap can be opened or closed by moving the slat backwards or forwards; by this arrangement the slat is in effect a false leading edge. Flaps and slats of exceptionally large area are fitted to aeroplanes designed to take off at a high angle following a short initial run (Fig. 40). In such applications the flaps and slats are so linked that they are mutually adjusted by a single control.

Skin Friction

Air flowing over a surface induces forces called skin friction, and in flight these forces absorb a large percentage of the aeroplane's engine power. Nevertheless if no friction were induced, no aircraft wing would have lift, for friction is due to the flow of air round the wing, and if there were no air flow round the wing, lift would not be induced ; and the air flow cannot be produced without friction.

Skin friction takes two forms. One is when the flow of air near the wing or other aeroplane surface is turbulent, the other is when the flow is smooth, or, as it is called, laminar. In ordinary aeroplanes the air flow over the wings is of both

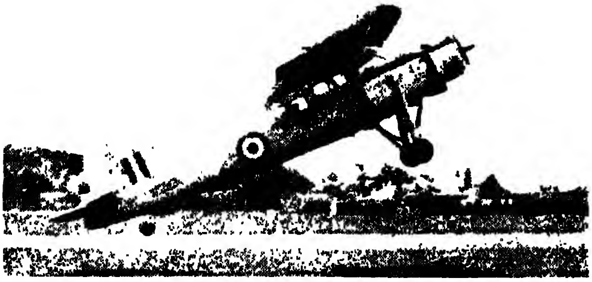


Fig. 40. SCOTTISH AVIATION PRESTWICK PIONEER. The large flaps and slats make it possible for this light-weight, high-wing aircraft to take off at an exceptionally steep angle, so that the aircraft can operate from airfields of small area.

types, because in the neighbourhood of the leading edge the flow begins as laminar, but as the air passes over the wing the laminar flow breaks up and develops a turbulent form.

The turbulence becomes more intense as it approaches the trailing edge of the wing. The result is that as the aeroplane moves forward it leaves behind the trailing edge of the wing an agitated pocket of air consisting of small vortices induced partly by the air flow from the upper surface of the wing and partly by the air flow from the lower surface.

The degree of turbulence is directly governed by aircraft speed At very low flying speeds the air flow over the wing is nearly laminar, but as speed increases, turbulence appears at the trailing edge of the wing, and gradually creeps forward when speed increases further. Drag induced by laminar flow is much less than that created by turbulent flows.

Overcoming drag dissipates a large percentage of an aeroplane's engine power, consequently an efficient wing delays as long as possible the transformation of laminar flow into turbulent flow. One way of achieving something towards this is to keep the leading portion of the wing as smooth as possible and to give the surface of the wing as regular a curve as possible. In this way drag can be reduced and aircraft speed increased.

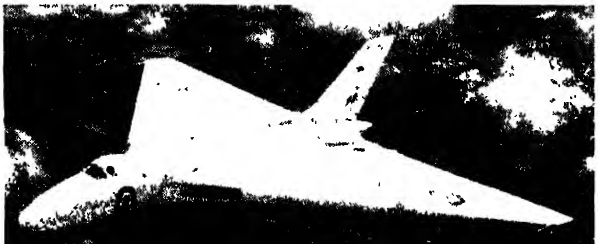
Drag

Drag, which is the aerodynamic force created at the trailing edge of a wing by the forward motion of the aircraft, is of two kinds; induced drag and profile drag. Induced drag is independent of the form of the wing section, but, governed by the proportions of the wing plan form, depends on the ratio of wing span to lift. The greater the span for a given lift, the less is the induced drag Induced drag is always greater at low speed than at high, and at speeds approaching that of sound (approximately 750 m.p.h at sea level) induced drag becomes nearly negligible

Although induced drag is negligible at high speeds, profile drag then assumes much greater proportions than at slow speeds. Profile drag depends entirely on wing section, and is due to dynamic pressure plus that due to skin friction It is higher for very thick wing sections than for very thin sections, and higher for a section which has irregular curves than for one which has smooth curves.

Profile drag is subdivided into form drag and skin friction Form drag is due to the shape of the aerofoil, whereas skin friction is affected by the shape of the wing over which air is flowing. With a well-designed wing, profile drag may be very little more than the normal amount of skin friction.

Total drag of a wing is the sum of the induced drag and the profile drag, and the total drag of any aircraft varies as to the square of the speed through the sub-sonic range. But with the development of jet propulsion and the consequent rise of aeroplane speeds to sonic levels



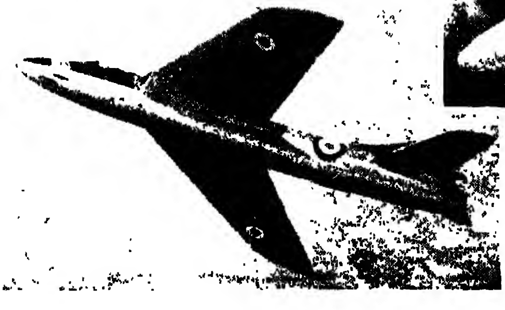


Fig. 41 (left). HAWKER HUNTER JET FIGHTER. The pronounced backward sweep of the wing is designed to reduce profile drag. Fig. 42 (above). Avro Vulcan Four-Engined Jet Bomber. The delta-shaped wing was the first serious attempt to evolve the ideal aircraft shape: that of an arrowhead.

Fig. 43. GLOSTER JAVELIN. This was the first twin engined delta fighter.

Fig. 44. DE HAVILLAND TWIN-ENGINED CARRIER-BORNE FIGHTER. The upright projection on the outer leading edge of the wing is called a fence. It improves air flow over the wing and reduces the tendency of a swept-wing aircraft to stall at low speed.

new conditions are induced which affect wing efficiency adversely. Profile drag rises rapidly and it is essential that the wing be so designed that the air flows over it smoothly.

Much can be achieved in that direction by giving the wings a pronounced backward sweep (Fig. 41), or by using a delta wing (Figs. 42 and 43). The ideal aircraft shape is that of an arrowhead, which has no projections to create resistance, and the aeroplane most nearly approaching this is the delta-wing aircraft. Another shape designed to increase efficiency at high speed is the crescent wing.

One of the disadvantages of swept-back wings is that their maximum lift coefficient is low and the effectiveness of their flaps is reduced. Moreover, a swept-wing aeroplane has a tendency to stall when landing, due to the outflow of the air stream when the aeroplane is flying at low speed. One method of overcoming tendency to stall at low speed is to fit fences on swept-back wings (Fig. 44). The function of the fence is to improve the flow of air over the wing, but the device is only a partial solution to solving the problem of preventing a stall when flying at low speed.

Another penalty of high speed is compressibility drag. This is somewhat analogous to the bow wave of a ship. The aircraft's forward motion is so rapid that the air in front of it has not time to get out of the way, so that the wings and fuselage begin to push in front of them a buffer of air. This quickly increases drag, and to overcome it greater engine power is needed. At the same time surface drag, caused by the air clinging to the wings and other aircraft surfaces, builds up.

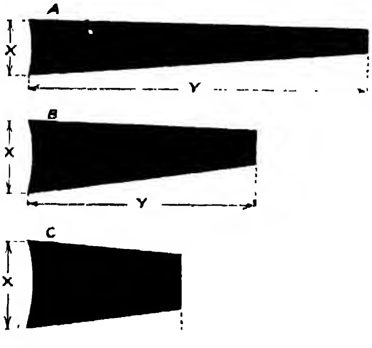


Fig. 45. ASPECT RATIO. These drawings of port wings illustrate the ratio of wing span (Y) to wing chord (X). A, high aspect ratio; B, medium aspect ratio; C, low aspect ratio (*see text*).

If the surfaces are rough or bumpy, speed goes down and drag increases. Surface drag can be reduced by arranging the camber of the wing to curve in such manner that it parts the air gently at the leading edge and allows it to flow off the trailing edge with a maximum amount of disturbance.

Aspect Ratios

As explained in Lesson 1, the boundary layer, a layer of thin air immediately adjacent to a wing surface, is a major cause of eddying and other disturbances which induce drag. The boundary layer can be kept down if the suction all over the wing is uniform. One of the most effective ways of doing this is by tapering the wing and other plane surfaces (Fig. 45). This is called high-aspect ratio, or the ratio of wing span to wing chord, and is expressed as the wing span squared divided by the wing area. High-aspect-ratio wings also improve an aeroplane's ceiling and its ability to climb.

Another problem posed by high-speed flight is interference drag. This is induced when the air, flowing over two adjacent parts, such as the fuselage and the wing, becomes turbulent when the two streams meet. The resultant drag is then greater than the sum of the individual drags. Interference drag is reduced by careful fairing of the wing root into the fuselage and burying the engines into the wing. The general shape and clean lines of the delta and swept-wing aeroplane built for high speeds have been inspired mainly to reduce interference drag. Giving a high polish to the surfaces of wings and fuselage reduces interference drag and so improves flight performance.

So far this Lesson has discussed the main fixed control surfaces of an aeroplane and noted certain movable control surfaces attached to them and improving their efficiency. We must now deal with the three major movable surfaces without which an aeroplane could fly only in a straight line on a horizontal course.

These three essential movable surfaces, which are all extensions of one or other of the main fixed surfaces, are the rudder and ailerons, by which the aeroplane alters lateral direction; and the elevators, which enable it to change altitude. Fig. 46 shows a simplified layout of the positions of rudder, ailerons, and elevators on a single-seat monoplane, and how they are controlled by the pilot's hands and feet.

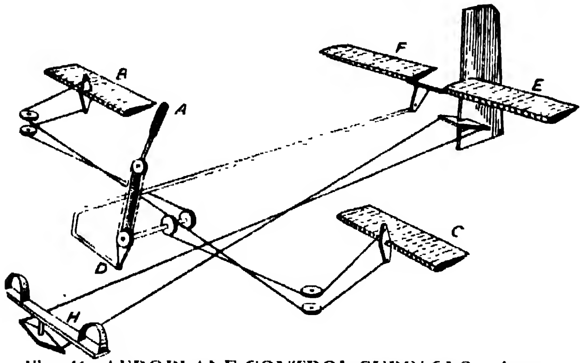


Fig. 46. AEROPLANE CONTROL SURFACES. A, control column or joystick; B, C, ailerons; D, linkage to elevators (E, F); H, foot-operated rudder-bar controlling rudder (J.)

Rudders and Ailerons

The trailing edge of the aeroplane's fin is hinged for the greater part of its vertical section to form a rudder, which is used for steering the aircraft in the same way that a rudder steers a boat. If, for example, the rudder is moved to the right, the air flow against it will try to move it back again, but if the rudder is held fixed in its new position, the air stream cannot force it back, so it turns the whole aeroplane round to the right.

Attached to each side of the rudder bar is a strong wire cable, and these cables are led through the fuselage to the cockpit, where they are fixed one to either side of the rudder bar, against which the pilot rests his feet. The rudder is moved by the pilot's pushing one foot or the other against the rudder bar, so pulling the rudder to left or right.

Because of its high speed an aeroplane could not easily be turned simply by moving the rudder, so the action of the rudder is assisted by the ailerons, which bank or tilt the aeroplane over, just as a cyclist banks when taking a corner at speed. Part of the trailing edge of each wing is in a separate piece hinged to the wing.

These hinged sections are the ailerons, and are connected by wires to the control column, or joystick. The control column is a vertical tube with a universal mounting at the bottom and a hand grip at the top. It can be rocked from side to side, as far as the pilot's knees will permit, and tilted fore and aft from his body to the instrument panel. Sometimes the control column is hinged half-way up to avoid pressing on the pilot's knees when moved laterally.

Movement of the control column sideways to the left raises the left aileron and lowers the right one. Air pressure against the lowered aileron then forces the right wing upward and the left wing downward. This causes the aeroplane to lean over or bank to the left, while at the same time the pilot's left foot pushes the rudder bar forward and so pulls the rudder to the left, which completes the manoeuvre and turns the whole aircraft to the left.

Reversing these operations turns the aeroplane to the right. With control column upright and rudder bar level, the aeroplane flies on a straight course.

Climbing and diving are by use of the elevators. These are two flat surfaces hinged to the trailing edges of the tail-plane, one on each side of the fin, and connected by wires to the control column. To climb, the pilot pulls the control column towards him, so pulling up the elevators. The air then presses down against the upper surfaces of the elevators, so forcing the tail down.

The nose of the aeroplane then tilts up and the machine begins to climb. At the same time, the rate of climb is increased by increasing engine power and so increasing the speed of the aircraft. To dive, the pilot pushes the control column away from him, so turning the elevators down. This causes the tail to rise and the nose to dip, and the aircraft begins gliding to earth.

Balanced Controls

The control surfaces described and the method of operating them are of an elementary type. The hinged surfaces used on fast and large aircraft are somewhat more complex and the method of their control more complicated. As speeds increased it was found that the considerable variations of air force on ordinary hinged surfaces made them too light for accurate movement at low speeds, and too heavy for accurate movement at high speeds. This was overcome by aerodynamically balancing the control surfaces.

Balance control surfaces are simply surfaces with extensions ahead of the hinged line, and can be arranged in a number of ways, two of which are shown in Fig. 47. A is what is called a horn-balanced rudder, in which the upper end

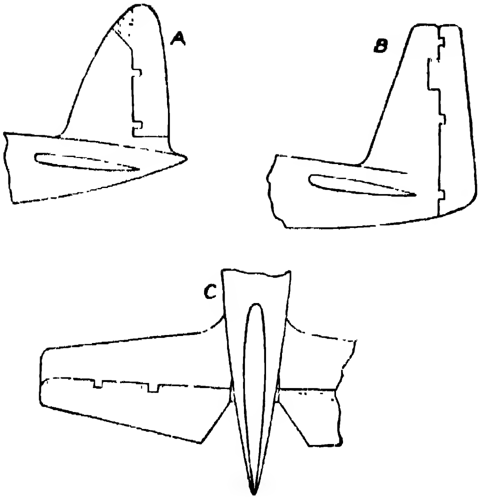


Fig. 47. BALANCED CONTROLS. A, horn-balanced rudder ; B, inset-balanced rudder ; C, the principle of balancing applied to elevators. In all three examples the shaded part of the drawing represents the balanced section of the control surface.

of the rudder projects over the top of the fin , B is an inset-balance rudder, in which a projection on the leading edge of the rudder is inset into the trailing edge of the fin, so that the fixed surface of the fin shields the hinged rudder from air flow until the moment of deflection In both these examples air pressure on the horn or inset surface when the rudder is deflected reduces the force needed to move the main rudder surface.

Because of the flexibility of the wing to which they are attached and the fact that they induce greater drag when deflected, ailerons are more difficult to balance One method is by differential operation. The control wires are passed over a gear wheel in such manner that the down-going aileron moves a very short distance relative to that of the up-going aileron. This causes less drag on the lower wing

Another and more effective method is to seal the gap between the wing and control surface (Fig. 48). When the ailerons are deflected, the surface pressure which is resisting the pilot leaks into the sealed space and assists deflection, while on the other side of the seal suction helps the action.

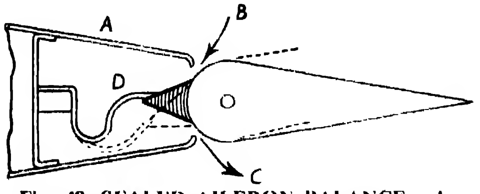


Fig. 48. SEALED AILERON BALANCE. A, shroud; B, pressure; C, suction; D, sealing strip.

Control movement can also be assisted by small surfaces called tabs, fixed near the trailing edge of the main control surfaces. The tabs are linked to the control column, and when the control column is pulled it first moves the tab in the opposite direction to that in which it is desired to move the control surface. This lessens the total force necessary to move the control, which is pulled over by a further movement of the stick.

To meet conditions consequent upon increasing aeroplane speed, a combination of servo and balance tab has been evolved. A balance action takes place until the load transmitted back to the pilot's control exceeds a predetermined value, whereupon a spring releases the linkage and the tab acts as a servo (Fig 49).

Pilot operation of control surfaces has in most aircraft become somewhat more elaborate than the simple control column and rudder bar. Pedals are now generally used instead of a foot bar for rudder control, and they can be arranged to give a parallel action more comfortable for the pilot.

The control column itself has a handwheel for operating the ailerons. Instead of rising between the pilot's legs, the control column is

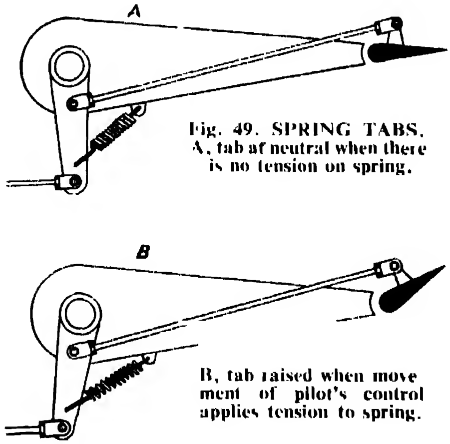


Fig. 49. SPRING TABS. A, tab at neutral when there is no tension on spring.

B, tab raised when movement of pilot's control applies tension to spring.

sometimes mounted at his side, and the aileron wheel is fixed on a horizontal extension to bring it in front of him. Another arrangement is to mount the wheel on a projection from the dashboard, in much the same manner as the steering wheel of a motor-car.

Controls and Sonic Speed

Swept wings and sonic speeds have led to various modifications and improvements in control surfaces. It was found, for example, that at sonic speed, elevator movement had to be very coarse to obtain good response and that

this large deflection made control rough in action. It was then established that a slight movement of the whole tail surface gave good elevator control.

Consequently, most aeroplanes of sonic-speed range have an all-moving tail with the elevators deflecting in a follow-up motion. Similar readjustments have had to be made to the positioning of ailerons on sonic aeroplanes. On many of these aircraft, particularly the delta-wing type, both elevators and ailerons are mounted on the trailing edges of the wing, the elevators outboard and the ailerons inboard.

Power-operated Controls

With the development of larger and faster aeroplanes, control surfaces became too heavy for direct manual operation, and power-operated controls were introduced. Sometimes the controls are electrically operated, but it is more common practice to use hydraulic power. Cables from the normal cockpit controls lead to the hydraulic valves near the control surfaces, and the valves feed two-way jacks which move the control surfaces in response to movements of the pilot's control column or wheel and rudder bar or pedal. Fig. 50 shows a power-operated elevator.

The valves and hydraulic supply are duplicated as a safeguard against failure. Powered controls have the great advantage that they hold the control surfaces so rigidly that their natural tendency to flutter is almost eliminated. On the other hand, they do not possess the natural feel that in manual controls prevents the pilot from making too harsh movement; but this disadvantage can usually be overcome by some form of spring loading. Many multi-engined aeroplanes have double or triple tail assemblies of rudders and elevators, and these are so linked that all the rudders move together and all the elevators move together.

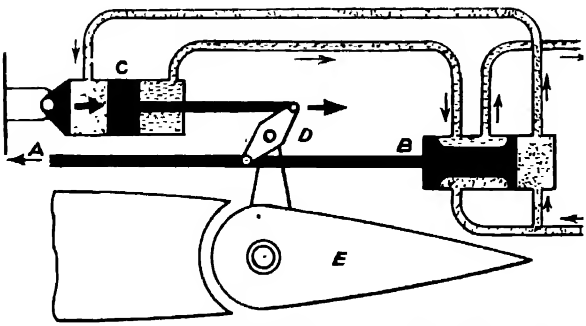


Fig. 50. POWER-OPERATED CONTROL OF ELEVATOR. Movement of control rod (A) increases hydraulic pressure of oil in cylinder (B) which passes through piping to cylinders C, when it forces forward a piston coupled to a linkage D, so moving aileron D. Arrows indicate directions of oil flow to and from cylinders.

At high aeroplane speeds the backward movement of the centre of pressure induces a twisting of control surfaces and the consequent alteration of air forces creates the condition called flutter. This builds up very rapidly because of the natural frequency of the hinged surface, and would ultimately disrupt the structure if flutter were not damped down by mass balancing.

Mass balancing consists in mounting a weight ahead of the control surface, so that the centre of gravity of the surface becomes coincident

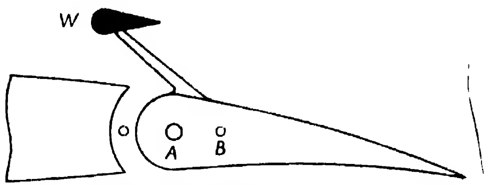


Fig. 51. MASS BALANCING. The weight W returns the centre of gravity of the control surface to the correct location. A, centre of gravity with weight; B, centre of gravity without weight.

with the hinge. The control surface thereupon becomes statically inert, and any upsetting force is thereby automatically damped. The mass-balancing weights are usually fixed internally, to prevent them from inducing drag, as they would if they were mounted on the exterior of the control surfaces (Fig. 51).

Movable control surfaces, provided they are properly arranged and mounted on a stable aircraft, need be moved only to alter direction or altitude, and it should not be necessary to "fly" on them. If, for example, the elevators have been moved to put the aeroplane into a glide, and the control column is then released, the aeroplane will in due course return to horizontal flight.

Similarly, movement of the rudder will turn the aeroplane, but immediately the pilot takes pressure off the rudder control the aircraft continues in straight flight. The fin and rudder together give directional stability and hold the aeroplane on a straight course when the rudder is not moved.

An efficiently designed aeroplane is so shaped and weighted that, if diverted from the flight course for which its controls have been set, it will automatically return to that course. When the aircraft has thus righted itself, the direction of motion may be slightly veered and some altitude may be lost, because recovery will be effected by a spontaneous manoeuvre; but the original airspeed, inclination of flight path to the horizon, and other details essential to stability and safety will reappear.

LESSON 5

Aircraft Materials and Construction

EFFICIENCY of any material used in the construction of an aeroplane depends upon strength combined with lightness, while the construction of a major structural component of an aeroplane must be such that the shape takes the loads.

This latter fundamental is well illustrated by the development of the aeroplane from the early biplane into the mid-20th-century monoplane. In the early days of flying the biplane's wings consisted of a light wooden framework covered with fabric and supported by a mass of struts and wires. Without these exterior supports the wings would have collapsed.

The first monoplane wings were built on much the same principle, except that the supporting wires were fixed to a pylon mounted on the fuselage (Fig. 52); this was because the wing itself lacked strength and rigidity. Eventually the exterior-supported monoplane wing developed into the contemporary stressed-skin wing on which the fabric is replaced by a metal covering which takes part of the load, so relieving strain on the inner wing structure.

Fig. 52. MONOPLANE in which Bleriot made the first flight across the English Channel, July 25, 1909. Note how the wing is braced by wires fixed to a pylon above the cockpit.

In the early days of flying, the aeroplane builder's choice of materials for main structural components was limited to wood, chiefly ash for wing spars and fuselage longerons, and spruce for members that did not have to carry great weight or were not subject to much strain or stress. Mechanically, wood of any kind is an unsatisfactory material for aircraft structures; it was chosen simply because it gave reasonable strength in relation to weight.

Its great disadvantage was that wing frames and fuselage skeletons had to be bulky, while the necessity of extensive internal and external stressing with steel wire complicated the building and maintenance of aeroplanes (Fig. 53). The application of metals was restricted to certain fittings such as strut sockets, turn buckles, tie rods, wing-supporting wires, and control cables.

Although many constructors attempted to build main structural components of metal they always failed because at that time metals, whilst of good strength for area and section, had weight out of all proportion to the strength obtained. It was not until the late 1920s and early 1930s, when metallurgists developed light alloys of high tensile and longitudinal strength, that metal revolutionised the whole method of aircraft construction.

Metal Frames

By the late 1930s wood and fabric had in general been displaced by metal in aircraft construction. At first thin steel tubing was used to build up fuselage and wing structures, which were then covered with fabric (Fig. 54). But presently thin metal sheeting had displaced fabric for large surfaces, and since 1930 there have been only two outstanding aircraft of wooden construction. One was the De Havilland Comet, which in 1934 won the McRobertson England-Australia air race (Fig. 55). The Comet had an airframe of wood, and the wings were built up of laminated wood sheets.

The second wood aircraft was the De Havilland high-speed twin-engined Mosquito which, when it went into service with the Royal Air Force in 1943, was the fastest military aircraft in the world.

Metals available to the aeroplane constructor are the steel aluminium alloys, magnesium alloys, and titanium alloys. Duralumin is favoured for wing coverings. Much of the structure of the very fastest aeroplanes is of high-grade light-weight steels. Metals are used in the form of sheets, bars, castings, forgings, and extrusions. Extrusions are made by forcing the metal, while hot and plastic, through dies. Extruded metals have good mechanical properties and can be used for making wing spans in single pieces up to 80 feet long.

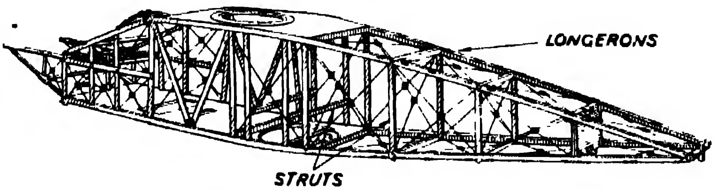


Fig. 53. SKELETON of fuselage of early aeroplane. The wooden longerons and struts are braced by diagonal wires.

An important development in the application of metals to stressed-skin structures is what is called tapered sheets, that is, metal sheets that diminish in thickness from one end to the other. On a wing, for example, the thickness of the sheet can be established according to the variations in stresses over the skin.

Thus, wing stresses steadily increase towards the root because every part of the wing transmits to the fuselage not only its own lift and drag but also the lift and drag of all parts of the wing outboard of it. Merely for economy of material combined with structural strength, a stressed-skin wing should decrease in thickness towards the wing tip.

This can be done by using a layer of metal sheets slightly overlapping each other and successively decreasing in thickness as they are stepped from the root to the tip of the wing. The disadvantage of this method is that it is wasteful of material, while the joints between the successive overlapping of the sheets prevents the wing from having an absolutely smooth surface. On the other hand, tapered sheets give a smooth wing by eliminating joints

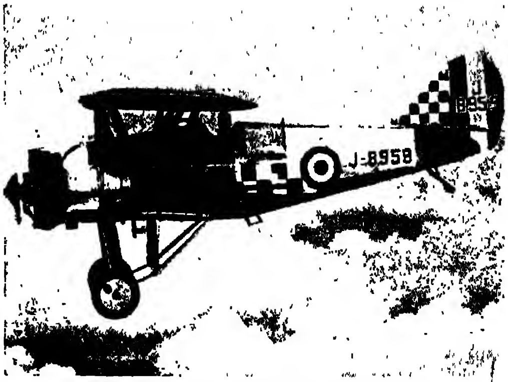


Fig. 54. SIDDELEY SISKIN BIPLANE OF 1920. The metal skeleton of the fuselage was covered with a fabric skin.

Use of Steel

Because of its relatively high weight compared with aluminium, magnesium, and titanium alloys, the use of steel is limited in aircraft structures. Its chief applications are as tubes to form fuselage and other frameworks which are clad with the lighter alloys. Special steels are also used to a great extent for components of both piston and jet engines.

Steel has occasionally been used for the thin tapered wings of high-speed aircraft because the narrow sections of the wings do not allow space for the internal bracing that would be necessary with most alloys. On piston-engined aircraft, propellers are usually of hollow steel forgings

For some purposes, particularly where intense heat is generated, steel is superior to aluminium and titanium alloys. Weight for weight and at normal temperatures, aluminium alloys have approximately the same strength as titanium alloys, and are approximately 50 per cent. stronger than steel.

At a temperature of about 150°C. the strength of a given weight of aluminium alloy drops to nearly half what it was at normal temperatures.

The strength of steel at similar high temperature drops less sharply and is about that of the aluminium alloy. A given weight or thickness of titanium alloy at 150° C. is about twice as strong as aluminium or steel.

At temperatures in excess of 200° C. the strength of aluminium alloys has so decreased that they are useless; but although the strength factor of both titanium alloys and steel have also fallen, titanium is about 50 per cent. the stronger. Thereafter the strength factors of both titanium alloys and steel continue to fall with rising temperature, titanium steadily losing strength until at 500° C. its strength factor equals that of steel. At temperatures exceeding 500 C. the strength of steel is greater than that of titanium alloys.

Flight Photograph

Fig. 55. RECORD BREAKER OF 1934. Of entirely wood construction, the De Havilland Comet was one of the last high-speed aircraft built of wood.

Turbine Blades

One of the greatest problems to be overcome in building an efficient jet engine is to reduce the effects of the intense heat generated in the turbine by the jet of expanding and burning gases. An additional problem is that when the fuel is shut off, a blast of cold air enters. This means that at one moment parts of the turbine become cool and are immediately afterwards made intensely hot.

As a result of alternate heating and cooling the metal expands and contracts hundreds of times a minute, and before very long ordinary metals and alloys would crack and buckle.

Consequently the jet engine requires special nickel alloys for turbine blades and combustion chambers. These alloys are called Nimonic, and for different duties have different qualities, each quality being indicated by a numeral suffix, e.g. Nimonic 75

Nimonic 90, Nimonic 95. Nimonic 75 is an alloy of 80 per cent. nickel and 19 per cent. chromium, the remainder consisting of small quantities of carbon, silicon, manganese, iron, titanium and aluminium.

Other Nimonic alloys contain fairly substantial parts of cobalt. Not only have components made from these alloys to be resistant to temperatures of the order of 75° C., but they must have great strength to withstand the strains imposed by, for example, a turbine disc, which spins at speeds in the region of 15,000 r.p.m.

Magnesium Alloys

As the following tables show, magnesium alloys are the lightest structural metals available to the aircraft constructor.

WEIGHTS OF METALS	
Metal	Weights in lb per cu. ft
Copper	550
Bronze	544
Gunmetal	529
Brass	505
Steel	490
Wrought Iron	480
Tin	462
Cast Iron	449
Cast Aluminium	160
Best Magnesium Alloy	122

SHEET METALS Specimen Comparative Weights			
S W G (*Standard wire gauge*)	Steel lb per sq ft	Aluminium lb per sq ft	Magnesium Alloy lb. per sq ft.
0	13·204	4·5	3·364
10	5·215	1·7	1·301
15	2·934	1·004	·733
20	1·467	·502	·366
25	·815	·278	·203

For a given spar or other structure the best magnesium alloy has a tensile strength of approximately 30 tons to the square inch, which is the same as that of mild steel. But the magnesium alloy has only about a quarter of the weight, and in a comparative standard is therefore four times as strong. Moreover, most magnesium alloys are easy to weld.

Complete airframes have been fabricated from magnesium alloys with a considerable saving in weight and man-hours compared with the use of other metals. Because of their low density, magnesium alloys make it possible for the skin of wings and other surface coverings to be thicker than would be possible with aluminium alloys. Consequently there is greater resistance to buckling of large surfaces and fewer stiffeners and their fastenings are needed.

It has been established that if two wings of identical size and shape are made, one from magnesium alloys and the other from aluminium alloys, the former needs 500 parts and 16,000 fastenings ; the aluminium wing requires 1,500 parts and 42,000 rivets and bolts for fastenings. Technical difficulties have to be overcome before magnesium alloys come into general use for complete airframes. Nevertheless, magnesium alloys have many important applications in aeroplane structures, notably window frames, fuel tanks, compressor casings, and undercarriage wheels.

The later development of metals for aircraft structures resulted in the curious manifestation of metal behaviour called fatigue. Just as a piece of wire will retain its strength if bent backwards and forwards a few times but will eventually snap at the point of bending if the bending is continued long enough, so will a metal aeroplane structure be liable to collapse if subjected to continuous strain

Metal Fatigue

Every metal structure has what is called a static-load breaking point, but this point can be reached before the full load is applied if a smaller force is repeated often enough Under these conditions the structure collapses because of fatigue.

Metal fatigue was not a serious problem until the rapid development of civil aviation after the Second World War. Previously aircraft, particularly large commercial aeroplanes, had not been required to fly for such long periods each year, nor had they to operate in all kinds of weather conditions. Gusty and bumpy flying conditions will set up deflections in the wings and tail units that become cumulative and will eventually induce a fatigue failure of the metal structure.

The cause of metal fatigue and the measures that must be taken to prevent it are not fully understood, but investigations into crashes thought to have been caused by metal fatigue suggest that the condition is most likely to begin at sharp corners, and where a structure has been initially weakened by the cutting of apertures for windows, doors or bolt holes.

Wing failure through metal fatigue can be avoided by the use of several small spars instead of one large one, so that if one spar should fail the others will absorb the load and so prevent the collapse of the whole structure.

By making tests to destruction on a structural component of any particular aeroplane built from any particular alloy, it is possible to calculate the fatigue life of that particular structure. A maximum number of flying hours, allowing a good margin for safety, can then be fixed for the aircraft. At the end of the safety period the aeroplane must be withdrawn from service, and the component which is most liable to metal fatigue must be replaced.

At transonic speeds and above, compression and friction caused by high-speed air flow over a wing surface induces a large temperature rise. This rise is such that above the speed of sound the temperature will have an effect on aluminium alloys and distort the structures made from them. In ordinary flight, wings and large control surfaces undergo a certain distortion or bending under load, but they return to their normal shape without permanent effect on the aeroplane. This is because materials used in aircraft structures have a certain elasticity at normal flight temperatures.

But at transonic speeds the heat generated is such that the metals' elasticity is reduced, and wings and other surfaces subjected to temperatures induced by high flying speed take a permanent set after distortion. The problem is really one of creep strength, and the degree of distortion depends upon the temperature and the amount of stress the structure is undergoing at transonic speeds.

One way of overcoming the difficulty of transonic surface-heat effects is by the development of special heat-resistant aluminium alloys, another is to fabricate wings and other structures from metals having a high creep strength. Two such metals are the titanium alloys and steel Steel is the most resistant, but because of its weight is generally rejected in favour of titanium alloys These have as good a strength and elasticity at high temperatures as steel has and they are consequently lighter.

Plastic Structures

Because they combine lightness with strength and resistance to corrosion and heat, plastics offer many advantages as material in aircraft construction Plastics are non-metallic substances produced by various chemical processes, and are of two main groups ; thermo-setting and thermo-softening. Thermo-setting plastics are moulded to shape, and once they have hardened anything made from them remains set and cannot be again softened.

Thermo-softening plastics, whether in sheet, rod, strip, or tube form, can be shaped after manufacture by the application of heat. Thermo-setting plastics are those most commonly used for aircraft components, but their applications were at first limited to components such as cockpit covers, instrument panels, and cabin fittings.

One type of plastic, phenol-formaldehyde resin, has been used extensively in bonding processes whereby laminations of wood are glued together and processed to form a kind of reinforced wood for wings and fuselage.

From plastic-bonded woods have developed moulded plastic wings and fuselages A resin plastic has of itself very poor strength, but this can be greatly improved by the addition of some kind of fibre. Fibres have remarkable strength in relation to their weight, and when embedded in a plastic resin result in a strong structural material.

There are two main kinds of plastic-resin-fibre material. One is glass fibre in a polyester resin setting, and the other is asbestos fibre embedded in phenolic resin. Without resin bonding, glass fibre has weight for weight five times the tensile strength of steel wire, while by similar standards asbestos fibre is three times as strong. In practice these strengths are not maintained when the fibres are mixed with the resins and moulded because of the limited strength of the bond between fibre and resin and the weakness of the resin itself. Nevertheless there are moulded resins and fibres which weight for weight equal in strength good-quality aluminium alloys.

One of the most successful resin-fibre materials consists of sheets of asbestos impregnated with a plastic resin The sheets are felt-like in appearance, and until moulded and cured under heat and pressure are soft and pliable.

To make a large structure such as a wing, a hollow mould is prepared and lined with several layers of the material. Sheets are used in such sizes that there are few joints and the thickness of the wing skin can be tapered by using fewer or more sheets as required. Metal brackets and steel plates for attachment of the wing to the fuselage can be embedded in the felt, which is built up at the roots and other points where stresses will be greatest.

The mould, sheets, and attachments are enclosed in an airtight bag from which the air is evacuated. This causes the interior pressure to fall to zero, so that the sheets are subjected to an atmospheric pressure of 15 lb. to the square inch. The plastic sheets in the mould are then subjected to a temperature of 150° C. The heating is by electricity and the heat is distributed throughout the sheets by electric heating elements, embedded in them near the surface.

When the sheets have become hard and rigid in the correct shape, the wing is removed from the mould and heated and polished to produce a smooth, glossy, and scratch-resistant surface. One of the great advantages of a moulded plastic wing is that for a given strength the skin will be thick, so giving freedom from buckling, and the outer contour accurate in form. Moreover, there are no joints, seams, or rivets to set up aerodynamic disturbances and so induce drag.

A fibro-plastic structure retains its strength at temperatures above those at which an aluminium alloy begins to weaken. The material is also a good insulator of heat, consequently temperature variations in flight do not reach the cabin so quickly when a fuselage is built up from fibro-plastic sections.

Wings and fuselage are the main structures of an aeroplane, and the chief factor in their construction is to combine strength and rigidity with aerodynamic principles and the minimum weight consistent with safety. Wherever possible, struts and bracing should be internal and all external projections must be avoided to reduce drag. Wing structures demand the greatest care in design and construction because of the exceptional loads and stresses to which they are subjected.

Load Effects

Loads and their effect on the general structure of an aircraft include air forces, such as lift and drag of the wing, drag on the fuselage, balancing loads on the tail unit, and the pressure of air flow during flight These loads and stresses are variable. Thus, when the aircraft is on the ground the whole weight of its structure is supported by the undercarriage, and the only surface loads are those imposed by wind at ground level.

When the aircraft taxis for take-off, acceleration and braking superimpose stresses, which although lessened by shock absorbers on the

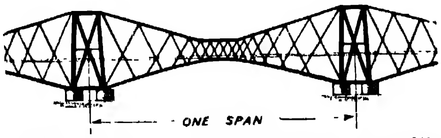


Fig. 56. PRINCIPLE OF THE CANTILEVER BRIDGE. This is the basis of the self-supporting monoplane wing.

undercarriage, are transmitted to the main structure. Loads are also imposed by the vibration of the engines and the thrust of the propeller or jet units.

Immediately an aeroplane becomes airborne, the weight of its whole structure is transferred from the undercarriage to the wing, and as the speed of the aircraft increases, the drag and surface load factors rise as the square of the speed. Movement of the control surfaces impose further loads which tend to twist the wing and bend the fuselage, while movement of the centre of pressure over the wing imposes twisting forces on that surface.

Moreover, manoeuvring an aircraft induces centrifugal accelerations and these increase the apparent weight of the aircraft ; in other words, individual parts such as engines cause weights several times greater than normal to be imposed on their attachment fittings. Because they are measured in terms of effective gravitational weight, excess loads induced by centrifugal acceleration are measured in units of g and added to the actual weight of the aircraft. An ordinary turn can impose perhaps 2 or 3 g, while levelling out of a power dive can induce an excess of 6 or more g.

From all this it becomes clear that an aircraft structure differs radically from that of, for example, a motor-car. Whereas the car body consists of a framework mounted on a chassis running on a road, an aeroplane in flight must be self-supporting and its components adequately braced and efficiently joined to each other.

Exterior bracing, which does not greatly interfere with the efficiency of a road vehicle in movement, is a serious matter on an aircraft as it induces drag. Consequently a wing should have a smooth surface if the aircraft to which it is attached is to be economical in engine power This can be achieved only if the wing is self-supporting

Cantilever Wing

One method of building a self-supporting wing is that called cantilever. The principle governing the construction of this type of wing is similar to that of the cantilever bridge (Fig. 56). An example of a cantilever is a wall bracket which has a flat surface jutting out from a wall horizontally and is supported by a strut member running underneath it and tapering out towards

57. Section through a two-spar monoplane wing.

the edge of the bracket. The main spars of a cantilever wing have the same tapering effect, and are much deeper at the root than at the tip.

The spars can be of any number and, placed at points in the wing where the greatest loads

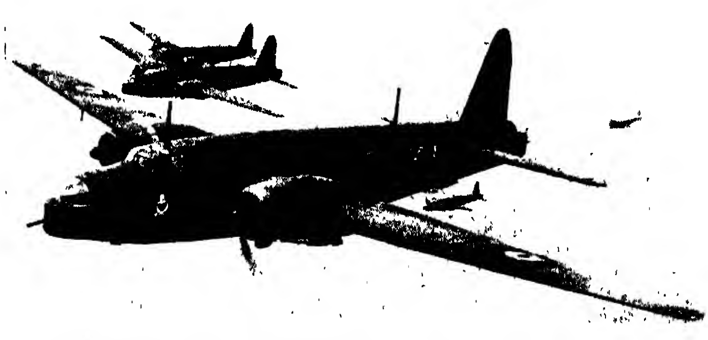


Fig. 58. WELLINGTON BOMBER. This was the first military aircraft built on the geodetic principle, so obviating the necessity of internal bracing. The Wellington went into service with the R.A.F. in 1939 and served throughout the Second World War. It was withdrawn from operational service in 1953, when 11,391 had been built.

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When the aircraft taxis for take-off, acceleration and braking superimpose stresses, which although lessened by shock absorbers on the undercarriage, are transmitted to the main structure. Loads are also imposed by the vibration of the engines and the thrust of the propeller or jet units.

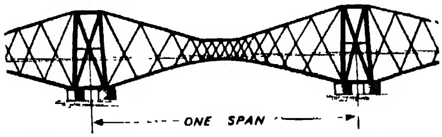


Fig. 56. PRINCIPLE OF THE CANTILEVER BRIDGE. This is the basis of the self-supporting monoplane wing.

Immediately an aeroplane becomes airborne, the weight of its whole structure is transferred from the undercarriage to the wing, and as the speed of the aircraft increases, the drag and surface load factors rise as the square of the speed. Movement of the control surfaces impose further loads which tend to twist the wing and bend the fuselage, while movement of the centre of pressure over the wing imposes twisting forces on that surface.

Moreover, manoeuvring an aircraft induces centrifugal accelerations and these increase the apparent weight of the aircraft ; in other words, individual parts such as engines cause weights several times greater than normal to be imposed on their attachment fittings. Because they are measured in terms of effective gravitational weight, excess loads induced by centrifugal acceleration are measured in units of g and added to the actual weight of the aircraft. An ordinary turn can impose perhaps 2 or 3 g, while levelling out of a power dive can induce an excess of 6 or more g.

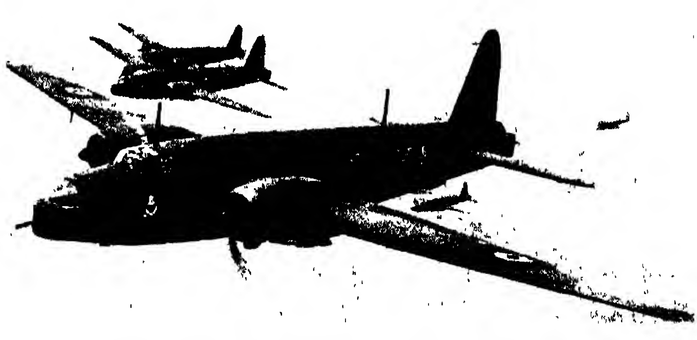


Fig. 58. WELLINGTON BOMBER. This was the first military aircraft built on the geodetic principle, so obviating the necessity of internal bracing. The Wellington went into service with the R.A.F. in 1939 and served throughout the Second World War. It was withdrawn from operational service in 1953, when 11,391 had been built.

From all this it becomes clear that an aircraft structure differs radically from that of, for example, a motor-car. Whereas the car body consists of a framework mounted on a chassis running on a road, an aeroplane in flight must be self-supporting and its components adequately braced and efficiently joined to each other.

Exterior bracing, which does not greatly interfere with the efficiency of a road vehicle in movement, is a serious matter on an aircraft as it induces drag. Consequently a wing should have a smooth surface if the aircraft to which it is attached is to be economical in engine power. This can be achieved only if the wing is self-supporting.

Cantilever Wing

One method of building a self-supporting wing is that called cantilever. The principle governing the construction of this type of wing is similar to that of the cantilever bridge (Fig. 56). An example of a cantilever is a wall bracket which has a flat surface jutting out from a wall horizontally and is supported by a strut member running underneath it and tapering out towards the edge of the bracket. The main spars of a cantilever wing have the same tapering effect, and are much deeper at the root than at the tip.

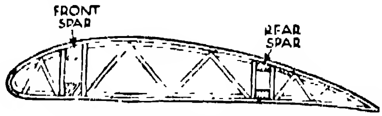


Fig. 57. Section through a two-spar monoplane wing.

The spars can be of any number and, placed at points in the wing where the greatest loads

occur, are strutted to each other internally. By this means the loads are distributed along the beams of the wing outwards from its point of attachment to the fuselage. The beams and struts are built up with former ribs to the wing contour. The metal or other skin is then placed on top to give the wing the desired smooth and correct shape (Fig. 57.)

Geodetic construction reduces the number of spars in a wing or fuselage and eliminates the necessity for major strutting. Geodetic construction had its first important application in the Vickers Armstrong Wellington bomber of the Second World War (Fig. 58). The principle of geodetic construction is based upon the use of a series of shaped light-weight metal bars interlaced to the contour of the required wing or fuselage (Fig. 58). This forms a basket of metal bars, and has the great merit of giving the wing or fuselage its strength on or near the actual surfaces which form their shape.

Theoretically, a geodetic structure such as a wing should, in common with any other basket, not require external beams or spars to maintain its shape, and its whole strength should be in its external shape, leaving the interior of the wing free to accommodate fuel tanks and other equipment. In practice, however, a wing, even one built geodetically, is subject to so many stresses in flight that it must have some degree of internal bracing. Accordingly a geodetic wing has stress spars, but they are comparatively light and in no way comparable with the spars in, for example, a cantilever wing.

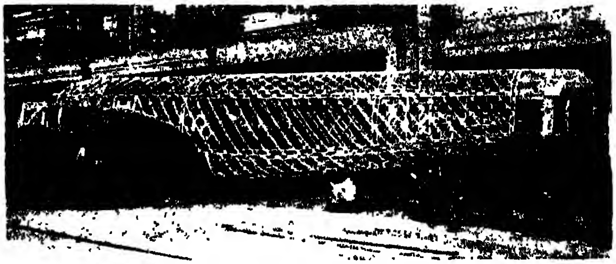


Fig. 59. Wellington Bomber fuselage under construction. The intersecting spiralled members are built into a framework like that of a loosely woven basket.

Stressed Skin

Since the end of the Second World War the general tendency of wing construction has been in the direction of stressed skin. The metal skin or covering of the wing forms the shape of the structure and bears the structure load. At first this type of wing needed a somewhat complex internal arrangement of struts and ties (Fig. 60), but the weight of this internal structure was comparatively light. Later, shell-like structures were developed whereon the skin takes more of the stress and greatly reduces the number of inner spars and stiffeners.

The most efficient way to build a fuselage and to assure for it a maximum strength-to-weight ratio is to construct it in the form of a hollow tube. This system is called monocoque, and its advantages are well illustrated by the relative strengths of a flat sheet of cardboard and a cardboard tube. Unfortunately it is seldom possible to make a fuselage in the form of a perfect tube, while the necessity for doors and windows drastically reduces its strength.

An efficient compromise is that between a tube and an externally braced structure. This is achieved with a skeleton of wing frames joined by longitudinal stringers (Fig 61). The framework is covered with sheet metal internally stiffened with strips to prevent the skin from buckling. Metal skin is strong in tension, but under compression is liable to buckle, whereupon its end-load resistance falls to zero.

Monocoque fuselage-construction became standard for airliners and other large aeroplanes, but for light aircraft it is more economical to build the fuselage covering round a framework of welded steel tubes reinforced by stress and tension wires.

Spot welding or, to give it its correct name, electric-resistance welding is extensively used to join metal skin and sheets to the framework of wings, fuselages, and control surfaces. A low-voltage current is passed through the parts to be joined which are held under pressure between the electrodes.

The resistance offered to the current passing through the electrodes by the metal to be joined induces a rapid temperature rise, and the metal in the vicinity becomes molten, whereupon the current is automatically switched off. The electrodes are generally in the form of discs which move the work along during the welding process, so that the process is continuous.

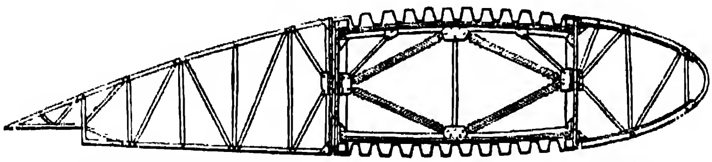


Fig. 60. Section through skeleton of wing before covering with stressed skin of metal. The main spar is of box form, and the leading and trailing edges are strengthened by struts and ties.

Electric-resistance welding is quicker and more economical of labour than is riveting, but because of the difficulty of avoiding flaws developing in the interior of the weld,

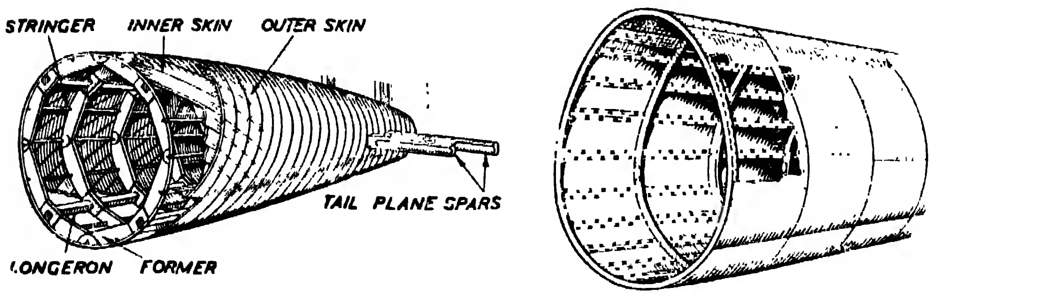


Fig. 61. MONOCOQUE FUSELAGE. Left, wooden skeleton around which 5-ply wood is wrapped and glued in spirals. Right, metal skeleton to which a metal skin is riveted.

it is seldom used for joining parts liable to be subject to high stresses in service. Fuel tanks and other structures and components not liable to heavy stress or load are seam-welded.

Riveting

Another, and more common, method of joining together the various components of an aircraft structure is riveting. At first ordinary aluminium or duralumin rivets were used, but these have given place to tubular rivets, the ends of which are flanged over from the outside by special tools. In order to reduce drag, wing and fuselage and other surface skins are flush-riveted, the rivets being countersunk so that their heads are level with the outer surface of the skin.

Chemical bonding, which is in effect a method of glueing, is increasingly used for joining metal to metal. The edges of the parts to be joined are coated with the bonding material and the joint is placed under a pressure of 150 lb. to the square inch at a temperature of 150° C. This results in an exceptionally strong bond because the bond covers a much larger surface area than a join made with rivets. Moreover, the absence of rivet holes means that the wing or other surface is not weakened and the absence of rivets means a considerable saving of weight.

LESSON 6

Airscrews: Piston and Turbine

Despite the development of the jet engine, the airscrew or propeller still has an important place in aeroplane propulsion. Not only are many large airliners powered by piston engines driving airscrews, but the gas turbine itself is used to revolve propellers. As explained in Lesson 3, the turbo-propeller aircraft is in some respects more efficient than one powered by pure jet engines.

When driven by a piston engine, an airscrew can be a tractor, if mounted in front of the wing, or a pusher, if mounted behind the wing. Both types perform the same function ; they screw their way through the air and pull or push the aircraft forward An airscrew is simply an arrangement of small wings (the blades) which are given an air speed by virtue of their rotation. Consequently, an airscrew develops lift at right angles to its motion through the air, and the blades produce an air circulation for the same reason, and in the same manner as an aeroplane wing.

Whereas in normal flight an aircraft wing is subjected to a uniform air velocity throughout its span, the velocity on an airscrew blade is not uniform, being at maximum at the blade tip. Moreover, velocity on an airscrew surface varies according to blade width and aerofoil section, and an angle of incidence that can vary all down the blade from tip to root.

Pitch

The blades of an airscrew are mounted on their hub so that their leading edges meet the airflow at a specific angle of attack, or pitch as it is called. The more acute the angle of attack, the greater is the pitch, until maximum pitch is reached when the leading edge of the blade is in line with the direction of flight. The meaning of pitch is best understood by the analogy of a nut on a bolt. The thread on any particular bolt has only one pitch, and the pitch is measured by the distance the nut will move along the bolt for a single turn. But because an aeroplane propeller moves in air, a yielding medium, and not in a solid nut, an airscrew has several pitches.

Effective pitch of an airscrew is the distance the aeroplane moves forward for one revolution of the propeller, and is expressed as a factor obtained by dividing the speed of the aircraft by the rate at which the propeller revolves.

Suppose that the aircraft is flying at 300 m.p.h., which would be equivalent to 450 feet per second ; if the airscrew is turning at 5,400 r.p.m., this would be equivalent to 90 revolutions per second. Dividing 450 by 90 gives 5 feet, which is the effective pitch of the airscrew under these conditions.

Any such figure would not be constant for any given aircraft or airscrew. Consider, for example, an aircraft accelerating on the ground preparatory to take-off. While the aircraft is stationary, airscrew pitch is zero, and although the propeller increases its rotation rate while the aeroplane accelerates, the airscrew does not increase rotation as quickly as the aircraft gains speed. This means that the effective pitch of any specific airscrew rises from zero to some definite figure as the aircraft gains speed.

Thrust

If an airscrew blade is considered as the wing of an aircraft, it is clear that the actual force on the blade is due to its area, its speed through the air, the angle of incidence with which it meets the air, and its aerofoil section. A secondary factor is the number of blades on the airscrew. Another important point to remember is that the actual force on the airscrew blade is not the thrust due to that blade but results from the force on the blade in the direction of the aircraft's flight.

Airscrew efficiency is complicated by the number of blades mounted on the hub, because two or more blades interfere with each other in the same way that two or more wings on a multi-wing aircraft interfere with each other. Theoretically, the most efficient airscrew would have only one blade, but in practice the minimum number is two.

In fact, the most efficient practicable airscrew has two blades, and multi-bladed propellers are used only when the power of the propulsive unit is so great that the airscrew's diameter necessary to cope with it would be so excessive as to make ground clearance impossible. Increasing the number of blades reduces airscrew diameter and blade-tip speed. Increase in engine power inevitably increases the number of airscrew blades, and has resulted in the contra-rotating airscrew discussed later in this Lesson.

Variable Pitch

As already explained, the effective pitch of an airscrew varies according to take-off and flight conditions, and also according to flying speed. Hence effective pitch is a variable quantity over an aircraft's speed range. The early airscrew consisted of two or more blades rigidly mounted on their hub and suffered from the defect that the blade angle or pitch had to be a compromise between that effective for take-off and that most efficient for the maximum flying speed.

With this type of airscrew, the most efficient blade angle for take-off is much finer than the pitch needed for maximum flying speed. An improved airscrew was later introduced which had the blades held in root bearings. Called the controllable-pitch airscrew, it permitted the angle of the blades to be altered so that they had two pitches : fine, for take-off ; coarse, for actual flying. Fixed and controllable-pitch airscrews are still used on small, low-speed aircraft.

From the controllable-pitch airscrew developed the variable-pitch airscrew which allows an infinite variety of blade angles to be selected within specific limits. Change in pitch is effected by the pilot through an assembly of cams and hydraulic pistons mounted on the propeller hub. Improvement of the variable-pitch airscrew resulted in the constant-speed airscrew, in which the blades adjust themselves automatically for any value of the forward speed. The mechanism of the constant-speed airscrew is so arranged that engine speed is kept constant by alteration of airscrew pitch.

There is a certain value of engine revolutions per minute which gives maximum operational efficiency, and it is always desirable to run the engine at that rate whenever possible. If engine speed increases, there is a slight increase or coarsening of airscrew pitch, and with a constant-speed airscrew the increase in blade torque automatically slows the engine down to its normal speed.

Operation of a constant-speed airscrew is automatic through hydraulic linkages, and depends on the position of the engine-speed control via a system of centrifugal weights and a powered pump unit.

Feathering

Variable-pitch and constant-speed airscrews are fitted with mechanism whereby the blades can be feathered, i.e. turned edge-on to the wind. When at that angle, approximately 90°, the airscrew pitch is said to be at infinity. Feathering is very desirable when, for example, an engine fails on a multi-engined aircraft.

By turning the blades of the stationary propeller edge-on, drag on the idle airscrew is reduced to a minimum, and the angle of yaw at which otherwise the aircraft would have to fly is reduced. Reduction of these factors gives the engines still operating a better chance to make up for the lost power.

Many airscrews have the blades so mounted on the hub that they can be twisted to give a reverse pitch. This means that although the engine shaft continues to rotate in the same direction, the thrust of the airscrew attached to it is backward instead of forward. Reverse pitch makes it possible for the airscrew to be used as a brake to slow down an aircraft with a high landing speed.

The braking effect of a reverse-pitch airscrew also helps a landed aircraft to come to a standstill when ice or other slippery conditions on a runway would otherwise prevent the landing wheels from obtaining grip.

One of the limiting factors in airscrew efficiency is that to absorb high engine power the airscrew must increase in diameter with a consequent increase in blade-tip speed. When the speed of an airscrew tip approaches the speed of sound, an increase in noise and a drop in efficiency occurs. At about nine-tenths of the speed of sound (1,000 ft. per sec.), these effects become serious. Moreover, excessive airscrew diameter means the use of high undercarriages to give ground clearance for the propeller.

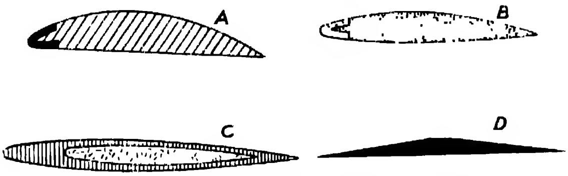


Fig. 62. Sections through the blades of four types of airscrew. A, wood laminations with metal leading edge (shown black); B, blade forged from a light alloy, and having an electric heating element passing through a rubber leading edge (shown by dots); C, hollow blade of forged steel filled with stabilising compound (shown by dots); D, solid blade made of high-tensile steel and specially designed for sonic speeds.

These disadvantages are overcome by the contra-rotating airscrew, which consists of two small-diameter airscrews mounted one directly behind the other on concentric shafts and driven by a single power unit. Gearing transmits the engine power in such manner that the airscrews turn in opposite directions to each other.

Another type of double airscrew is that known as the co-axial. Like the contra-rotating airscrew, the co-axial consists of two sets of blades mounted one behind the other on concentric shafts, but instead of being geared to rotate in opposite directions each is separately driven by its own half of a double engine. One airscrew can be stopped for low flying speeds, so economising in fuel; for maximum speed, both halves of the engine are switched to revolve both airscrews.

Besides efficiently absorbing the energy of high-powered engines, contra-rotating and co-axial airscrews eliminate torque reaction and by straightening the slipstream prevent unsystematical air flow over the aeroplane's wings and control surfaces.

Turbine-driven airscrews are in their action and the thrust they develop similar to those driven by piston engines, but they must be able to cope with much higher acceleration and more rapid change of pitch. Consequently the variable-pitch control system must be able to effect pitch changes of the order of 30 degrees per second over a very wide range. This problem of rapid change of pitch has to a great extent been solved by the use of electronic control systems.

Although pure jet-propulsion is more efficient for flight at supersonic speeds, airscrews have been developed for use at such speeds. The blades are usually of solid steel and of swept or scimitar shape, and have in flight been able to absorb 6,000 h.p. at 5,000 r.p.m. Specially designed for high speeds, they lose much of their efficiency at speeds below 400 m.p.h.

Airscrews can be of wood or metal (Fig. 62). Wooden blades are formed from a billet prepared by bonding together with a suitable resin a large number of thin sheets, and then compressing the lamination in a power press. The lamination is thereafter cut and machined to the correct blade shape. The finished blade is given a plastic coating as protection against the weather and a thin metal skin over the leading edge and tip to reduce loss of aerodynamic efficiency through wear.

Nowadays most airscrews are made from metal. The smaller type of blade is forged from solid billets of light alloy and machined to the required contour. Larger blades are generally fabricated from hollow steel forgings and after machining are filled with rubber, expanded foam, or some other stabilising compound.

LESSON 7

Helicopters and Vertical-lift Aircraft

An aeroplane must travel along the ground for a distance in order to gain sufficient momentum to take off and become airborne. Similarly, an aeroplane coming in to land must fly to touch down at a speed of not less than its stalling speed. After touching down it must travel along the ground to absorb the forward momentum of its landing speed. The length of take-off or landing run depends upon the size and weight of the aircraft and the power of its engines.

The minimum safe landing speed of a large airliner is about 100 miles an hour, and this means that it must land on, or take-off from, a runway a mile or more in length. Were it not for brakes on the undercarriage wheels and the braking effect of reversible propellers, landing runs would be considerably greater.

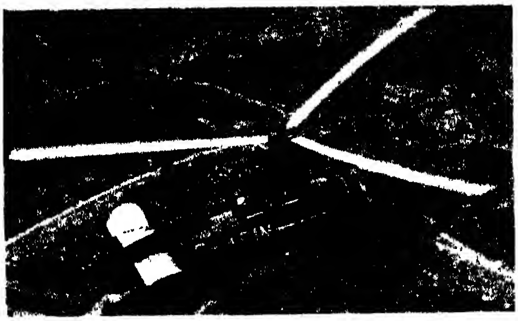


Fig. 63. "AUTOGIRO". This was the first practical vertical-lift aircraft. Its rotor was power-driven only at take-off. Thereafter forward movement was imparted by a normal airscrew in the nose of the fuselage, and the rotor revolved freely in the slipstream.

Necessity for long runways means that airports are expensive to build and to maintain and, because suitable land is scarce in large cities, they seldom can be sited in cities. Consequently airports have to be some distance from the main centres of population they serve, and air passengers sometimes spend as much time getting to and from airports as they do on their actual journeys by air.

To overcome these difficulties and so bring air services within the confines of built-up areas, the helicopter and other types of vertical-lift aircraft have been developed.

Most vertical-lift aircraft are of what is called the rotating-wing type and have as their basis of operation an airscrew rotating about a vertical axis. An elementary example of this is the child's toy consisting of a propeller which is pushed into the air from a length of rod grooved like a corkscrew . when the propeller leaves the corkscrew rod the momentum from its rotation carries it upward for some distance and when the momentum is expended it flutters to the ground.

Rotating-wing aircraft are of two kinds, the gyrodine and the helicopter, and they differ from the aeroplane or fixed-wing aircraft in that their lift is derived from what is virtually a variable-pitch airscrew (see Lesson 6) revolving in a nearly horizontal plane. The gyrodine's rotor is power-driven only for take-off, whereas the helicopter's rotor is power-driven both for take-off and for forward flight. Both have the advantage that, unlike the aeroplane, they do not require forward speed to induce the lift necessary to take off.

"Autogiro"

The first practical gyrodine was the "Autogiro," which, invented by the Spanish engineer Juan de la Cierva, first flew in 1923. The "Autogiro" is a compromise between the aeroplane and the helicopter (Fig. 63). The rotor is power-driven only for actual take-off, after which the machine derives forward motion from a conventional engine and airscrew. When it is clutched out of the engine, the rotor revolves freely in the slipstream from the airscrew and becomes, in effect, a revolving wing to provide the machine's l ft.

In the event of engine failure the rotor continues to revolve freely and the "Autogiro" descends to earth at a steep angle, the autorotation of the rotor providing sufficient lift to prevent a too-rapid descent.

Although work on the "Autogiro" was eventually abandoned in favour of developing the helicopter, the principle of the rotor is common to both and was first demonstrated in practical fashion on Cierva's machine. Most rotors have three or more blades, but the functioning of a rotor when it moves an "Autogiro" or helicopter through the air in forward flight is best understood by considering the action of a two-bladed rotor.

Rotor Lift

Consider, for example, a rotor which has a diameter of 40 feet and rotates at a speed of 250 r.p.m. The tips of the rotor will then be travelling at approximately 350 m.p.h., and if the aircraft to which the rotor is attached is flying forward at 100 m.p.h. the leading edge of the blade travelling round in the direction of the aircraft's motion will meet the air at 455 m.p.h.

The rotor blade moving away from the aircraft's direction of motion will be travelling at a relative speed of only 255 m.p.h. Lift being proportional to the square of the speed, the advancing blade induces much more lift than does the retracting one, and unless this differential is adjusted the machine on which the rotor is mounted will roll over sideways or capsize.

There are several ways in which the lift of a rotor's blade can be equalised. The most efficient was that devised by Cierva for the "Autogiro" and since adapted for the helicopter. This consists in hinging the blades to the rotor hub so that they are free to rise or fall from the horizontal within controlled limits. As the advancing blade rises, it reduces its angle of incidence and consequently its degree of

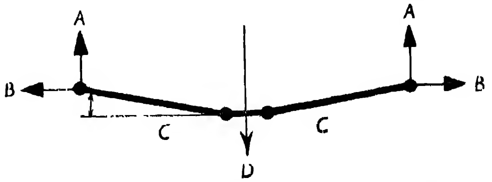


Fig. 64. CONING ANGLE. The coning angle is the resultant of lift and centrifugal force, as expressed in the above diagram ; A,A, lift ; B,B, centrifugal force ; C,C, coning angles ; D, helicopter weight.

lift; conversely, the retreating blade falls, so increasing its angle of incidence and therefore its degree of lift.

When a helicopter is in forward flight, the rotor blades are not horizontal but are inclined at a slight angle to the horizontal plane. This is the resultant centrifugal force, which tends to cause the blades to fly out straight, and the lift force, which tends to make them rise.

This angle is called the coning angle, Fig. 64, and if it becomes excessive it will induce extra drag. Consequently the blades' weight must be carefully calculated and rotor speed kept constant.

Torque Reaction

If, as with a helicopter, there is no conventional airscrew, and the machine derives its forward motion from a power-driven rotor, the spinning of the rotor creates a torque reaction. This reaction, which would cause the fuselage to spin around in a direction opposite to that in which the rotor revolves, occurs only with single-rotor helicopters. There are several methods of countering torque reaction; the most efficient for a single-rotor machine is to mount a variable-pitch airscrew (Fig. 65) on the tail-unit of the helicopter to rotate in a vertical fore-and-aft plane. The tail airscrew of a helicopter, which is driven by an extension shaft from the main rotor engine, performs much the same function as the rudder of an aeroplane. If the helicopter is to be kept in straight flight, the pitch of the tail airscrew is so set that its thrust exactly balances the torque reaction from the rotor drive. As the main rotor revolves in a clockwise direction, the tendency of the fuselage is to rotate in an anti-clockwise direction.

Consequently the tail of the machine tends to swing to the right, but is balanced by the tail airscrew. If the airscrew pitch is lessened, its thrust no longer balances the torque and the tail swings to the right, thereby turning the helicopter to the left. The reverse effect turns the helicopter to the right.

Pitch of the tail airscrew is controlled by the pilot through what are called tail-airscrew pitch-control pedals, which are the equivalent of the aeroplane's pilot's rudder bar. But unlike the rudder of an aeroplane, the tail airscrew of a helicopter does not require forward motion of the aircraft to become effective; it will turn the helicopter while it hovers.

It is possible to cancel out torque reaction by using two or more rotors (Fig. 66). These may be placed one above the other and running in opposite directions (contra-rotating); two side by side and intermeshing; two placed in tandem; or two carried side by side on out-riggers from the fuselage. The usual practice is to have two rotors in tandem, that is, one at each end of the fuselage, and rotating in opposite directions.

This arrangement means that one rotor counteracts the torque of the other and no tail airscrew is needed. Consequently the helicopter has to be manoeuvred entirely by altering the angle, and therefore the pitch, of the rotors. For simplicity, the following explanation of ascent and flight is confined to the flying of a single-rotor helicopter mounting a tail airscrew.

Pitch Control

Each rotor blade is in effect a wing and is subject to the aerodynamic laws governing lift. Hence it is possible to vary lift by varying the speed of rotor rotation. Because of the time-lag while a rotor was gaining or losing speed this would be impracticable, and in practice the speed

Fig. 65. BRISTOL SYCAMORE HELICOPTER. This single-rotor helicopter accommodates a pilot and four passengers, and its 500-h.p. nine-cylinder Alvis Leonides radial engine drives the main three-bladed rotor (48 ft. in diameter) and also the variable-pitch airscrew mounted on the tail assembly. The function of the tail airscrew is explained in the text. The Sycamore has a maximum speed of 127 m.p.h.

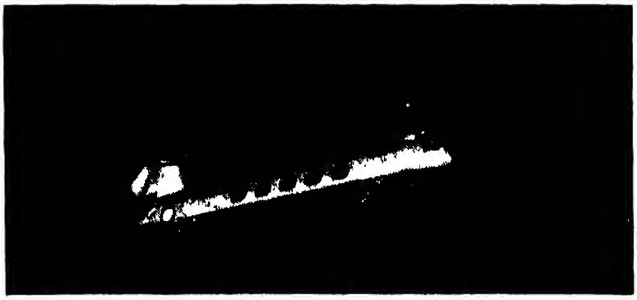


Fig. 66. BRISTOL TYPE 173 TWIN-ROTOR HELICOPTER. The first multi-engined British helicopter, it has accommodation for 13 passengers. Each of the 48-ft. rotors is driven by a 500 h.p. Alvis Leonides radial engine and the helicopter has a maximum speed of 130 m.p.h. The stub wings improve forward flight performance.

of the rotor is kept constant and the lift coefficient varied by adjusting the angle of attack, or pitch, of the blades.

To take off, the pilot gets his rotor running at a specified number of revolutions a minute and then moves a control called the collective pitch lever, which increases the pitch of all the rotor blades simultaneously. Immediately the lift developed by the rotor is greater than the gross weight of the helicopter, the machine begins to rise in hovering flight. At that point the lift exactly balances the weight, and the helicopter can then be raised or lowered by increasing or decreasing the pitch of the rotor blades.

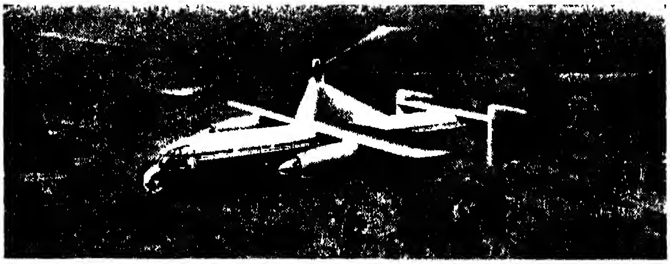


Fig. 68. FAIREY ROTODYNE. This compromise between the helicopter and the aeroplane is designed to carry 40 passengers at a speed of approximately 200 m.p.h. The prototype was ordered by the British Ministry of Supply in 1955.

Cyclic Pitch Control

In addition to providing the helicopter with lift, the rotor must give the machine forward and lateral motion. This is done by means of the cyclic-pitch-control column, which occupies the same position in the pilot's cabin as does the control column of an aeroplane and moves in a similar manner. The only difference is that it projects downwards from the fuselage canopy instead of rising from the floor.

Fig. 67. ROLLS-ROYCE VERTICAL TAKE-OFF MACHINE. Popularly called the "flying bedstead," this experimental aircraft had neither rotor nor wing, but derived its ability to ascend, fly, and descend from control of the reaction of two jet engines.

Unlike the collective-pitch-control lever, the cyclic-pitch-control column does not alter the pitch of all the rotor blades simultaneously but changes the pitch of each blade at certain fixed points in the complete cycle of the rotor revolution. Moving the cyclic-pitch-control column forward tilts the rotor forward, so increasing the pitch of each blade as it passes through the rearmost part of the cycle, and decreasing the pitch of each blade as it passes through the forward part of the cycle.

This inclines the direction of the line of thrust and in consequence the direction of the helicopter's flight. Hence moving the cyclic-pitch-control column forward causes the helicopter to move forward. Moving the column to the left increases rotor pitch in that direction, and therefore the helicopter moves sideways to the left; the same thing happens, but in the other direction, when the control column is moved to the right.

Height is gained or lost in flight by moving the pitch-control lever, which is unaffected by the cyclic-pitch-control column. As already explained, direction is controlled by altering the pitch of the tail airscrew. Directional control of a twin-rotor helicopter is by altering the speed of one rotor relative to the other.

In the event of engine failure, the rotor or rotors are declutched from the engine and the helicopter floats to earth supported by the freely spinning rotors, which are revolved by the upward current of air induced by the machine's descent.

Power Units

Most helicopter rotors are powered by piston engines. Twin rotors sometimes take their power from a single engine through appropriate shafting, but with large helicopters it is preferred to have a separate engine for each rotor. This latter arrangement provides the same safeguard against engine failure as does the power arrangement of a multi-engined aeroplane. The engines for the rotors have a common gearbox, so that if one engine fails the other engine can drive both rotors.

Helicopters have also been built with rotors driven by jet engines fitted to the tips of the blades. These engines can be ram-jets or simply combustion chambers fed with compressed air from a gas turbine in the fuselage. Combustion chamber propulsion means that the rotor head and rotor blades must be hollow. The ram-jet is the simplest system of blade-tip propulsion, but it is excessively noisy and not particularly efficient.

Another method is to force compressed air through hollow rotor blades to the tips, whence it escapes through jets and by its reaction pushes the rotors round. The exhaust gas from the engine driving the compressor, which is installed in the fuselage, is carried to the rear where it escapes through valves on either side of the tail. Releasing gas from one or other valves alters the direction of the helicopter's flight.

"Flying Bedstead"

One type of vertical-lift aircraft, first demonstrated in 1954, dispenses with a rotating wing and derives its ability to ascend, fly, and descend from the reaction of two jet engines. Lift is generated directly as thrust by the two engines, the exhausts from which feed into common down-pointing outlets. The downward thrust of the jet engines, totalling 10,000 lb., literally pushes the aircraft off the ground, and when the desired altitude is reached, horizontal motion is achieved by tilting the machine and so altering the angle of the jet reaction.

The aircraft then moves forward like a jet-propelled aeroplane. To descend, the machine is brought on to a level keel, and control of the jet thrust controls the rate of descent.

Rotodyne

Helicopters are much slower than fixed-wing aircraft driven by jet or piston engines, and numerous compromises have been designed to combine the vertical lift of the helicopter with the forward speed of the aeroplane. One of the most successful is the rotodyne (Fig 68). The rotodyne has a single fixed wing and a helicopter rotor, the latter being driven by compressed air from a turbine in the fuselage.

The four-bladed rotor lifts the aircraft to the required height, when forward propulsion is provided by two turbo-prop airscrews mounted on the leading edge of the wing. Direction of flight is by rudder as with a conventional aeroplane. The rotodyne has a forward speed of 250 m.p.h., which is about double that of an ordinary helicopter. In some respects, the rotodyne is a reversion to the "Autogiro," except that rotor and airscrews are power-driven.

Although it does not impart to an aircraft the entirely vertical lift of the helicopter, the system called jet deflection greatly reduces the distance that an aeroplane must travel along the ground before it becomes airborne. Jet deflection was first given practical demonstration in 1955 on an adapted Meteor fighter. Two Rolls-Royce Nene jet engines were fitted with deflectors midway along their jet pipes. The deflectors could be moved 60 degrees downwards so that part of the thrust of the engines reacted against the runway and forced the aircraft into the air at a steep angle. Another advantage of jet deflection is that it reduces landing speed, a particularly important consideration when jet fighters have to land on aircraft carriers.

Other attempts to solve the problem of combining vertical lift with good horizontal speed are seen in the "flying bedstead" (Fig. 67) and the Convair V.T.O. (Fig 69)

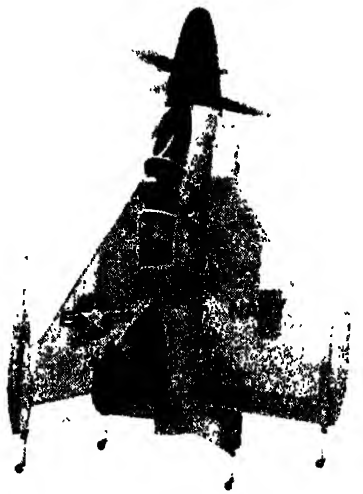


Fig. 69. CONVAIR VERTICAL TAKE-OFF FIGHTER. This U.S. Navy aircraft was designed to take off and land vertically, yet to reach high speed in horizontal flight. The fuselage has a delta wing in the mid-portion with the fin and rudder and a matching underside fin at right angles to the wing. At the corners of these surfaces are four wheels to serve as landing and take-off gear. The normal static attitude of the machine is vertical. When the aircraft reaches a certain altitude, it levels out and flies horizontally. Its maximum speed is then 500 m.p.h. The pilot's seat is mounted in gymbals so that it automatically assumes suitable positions for vertical and horizontal flight.

LESSON 8

Aircraft Design, Production, and Research

In the early days of flying, aeroplane design was very much an affair of the individual ; one man conceived the idea of some particular aeroplane, drew the plans of all its components, and nursed it through every stage of production. But with the increasing size and complexity of aeroplanes this became no longer possible, with certain rare exceptions. One exception was the Spitfire, which R. T. Mitchell designed and presented as a single idea.

Few aeroplanes, whether civil or military, are nowadays built as a speculation in the hope of "finding a purchaser." A new aircraft is intended to meet a specific market demand and is planned by a manufacturing company's design team with the object of its going into quantity production. The design team includes the head of the drawing office, the chief engineer, the works manager, metallurgists, mathematicians, and production experts.

Team Conferences

At the head of the team is the chief designer, who has drawn up the fundamental scheme for the new aircraft, and thereafter supervises the main stages which lie between the drawing-board and the completed aircraft's coming off the assembly line.

The design team meets in innumerable conferences during the planning and production stages to discuss progress, to consider any improvements that can be made, and to overcome the inevitable difficulties that arise. By these means mistakes in design are less liable to occur and the aeroplane is not liable to develop serious faults at any stage of production.

Successful aircraft design and therefore an efficient aircraft depends upon close co-operation between the aerodynamic and the production departments of the manufacturing company. Because it is constantly discovering methods whereby the performance of an aircraft about to go into production can be slightly improved, the aerodynamic department is always trying to introduce new modifications in design.

Apart from one fundamental difference, the problems to be solved in the design of an efficient aeroplane are common to civil and military aircraft. That fundamental difference is cost. Provided a military aircraft will efficiently perform the duties for which it is specifically designed, its costs, both capital and operating, are a comparatively minor consideration, whereas the capital and operating costs of a civil aircraft are limited by the fact that they must be more than recovered in revenue from the transport of passengers, mail, and freight. Other factors affecting the design of military aircraft are discussed in Lesson 15. This Lesson is limited to the design and production of civil aircraft.

Fundamentals of Design

There are three fundamentals upon which all aeroplane design must be based. The aircraft must be able to fly ; it must be able to carry its engines, equipment, passengers, and crew ; and it must be able to take off and land. Consequently the aeroplane consists of five major parts : the wings, the fuselage, the control surfaces, the engines, and the undercarriage. The design of each of these parts has one problem common to them all—they must be as light as possible without sacrificing the strength necessary to withstand the forces that will react upon them when the aircraft goes into service.

Governments enforce regulations specifying the strength factors of all types of aircraft, and it is the function of the designer to keep down weight without infringing these regulations and so jeopardising the safety of the aircraft. An aeroplane can lift off the ground only a weight relative to that of itself. Every pound saved in the weight of the aircraft's structure, power unit, and fuel means a pound more of useful weight in the way of passengers, mail, or freight, that can be carried.

Economic Payload

Ratio of payload to total weight of aircraft structure, engines, and fuel is the bugbear of all commercial aircraft design, and constant vigilance is essential to prevent excessive weight from creeping in. The structure, equipment, power plant, fuel, and crew account for approximately 85 per cent of the all-up weight of the average airliner, leaving only 15 per cent. for payload.

An increase of only 1 per cent. in the all-up weight of the aircraft would reduce its carrying capacity by 1/10 or 10 per cent. It has been estimated that a saving of 2 per cent. in the structural weight of an aircraft weighing 60,000 lb. and logging 2,500 flying hours per annum would represent a 10 per cent. reduction in operating costs and an increase in annual earning capacity of £70,000.

It is a comparatively easy matter to increase payload at the expense of structural strength but any designer who does so is certain to have the aircraft refused the certificate of airworthiness without which it is not permitted to fly.

When calculating the strength factor of an aircraft, there is no particular starting-point. The problem must be treated as a whole, and

all the stresses of take-off, flight, and landing considered simultaneously. Calculation of structural strength consistent with safety depends upon the function of the aeroplane. An airliner, for example, is not required to dive so steeply or to level out so suddenly as a fighter : neither is an airliner subject to the same stress, accelerations of turning, and other manoeuvres.

To withstand air turbulence, commercial aircraft are stressed to meet gusts of up to 66 feet per second, whereas a factor of 25 feet per second is considered a sufficient margin for military aircraft. After all the calculations of stress have been made, a margin is allowed to provide what is called a safety factor. The safety factor takes into account any inaccuracies in the calculations, and variations in the quality of the materials and the standards of workmanship. In general, the safety factor is assessed at 1½-2 ; which means that the completed aeroplane structure will be that much stronger than the original calculations specified as necessary.

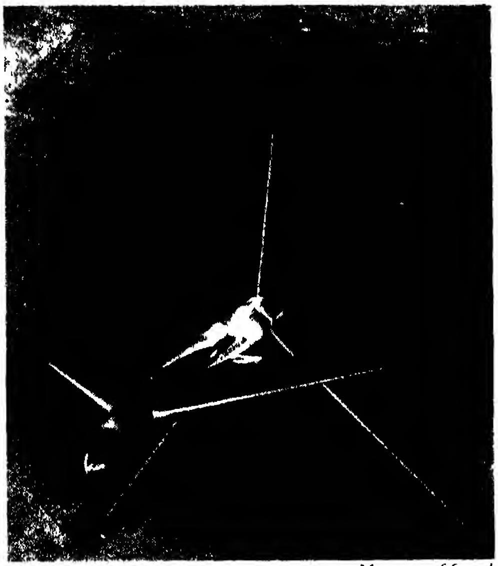
When the mathematicians, physicists, and engineers have finished their calculations, the work of the drawing office begins and draughtsmen prepare plans of the various components that will make up the completed aircraft. Most drawing offices are divided into sections, each of which is responsible for a specific part of the aircraft.

Provided the stress calculations and the drawings are approved, major components are built and tested to ensure that they meet the requisite standard of strength. Specimens of a whole wing, fuselage, or tailplane are placed in test frames and rigs which bend and stress them to the point of destruction. Instruments constantly record the stresses throughout every part of the structure during the progress of the test, while cameras provide a continuous record of the gradual wrinkling that shows up weak points before destruction.

Strength tests of wings are particularly important. Several successive tests are made and after each the specimen is rebuilt and improved. Very often the final test to destruction achieves a 20 per cent. higher breaking-point than the first, and on occasion this has made it possible for the all-up weight of an aircraft to be increased by as much as 5 per cent. with a corresponding increase in payload.

Similar tests of behaviour under load are also essential for establishing whether or not the design of undercarriages, airscrews, engine-mountings, etc., confirm the designers' plans.

Design estimates of the projected aircraft are tested on models in a wind tunnel (Fig. 70). The models vary in scale from as much as one-third of the size of the projected aircraft to as small as a replica on a scale of a few inches. The wind tunnel is the most important piece of equipment



Ministry of Supply

Fig. 70. WIND TUNNEL. Model of delta-wing aircraft undergoing aerodynamic test in high-speed wind tunnel at the Royal Aircraft Establishment.

at the disposal of the aircraft designer, and provides the link between theoretical and practical aerodynamics.

A wind tunnel is a circular, elliptic, or rectangular passage through which air is drawn at a uniform speed by a powerful extractor fan. The air is always sucked, never blown, along the tunnel, so ensuring steadiness and uniformity in the air stream that flows over the model. The exit end of the tunnel has a diameter equalling the span of its fan propeller, but at the centre and entrance it contracts. This compresses the air and so speeds up its velocity.

A wind tunnel is sealed in a rectangular chamber, the return air circuit forming a double path on either side of the tunnel between the flume and the chamber walls. A system of slotted screens or vents regulates the return flow of air to the tunnel mouth and prevents eddies and other disturbances likely to set up fluctuations in the airspeed through the tunnel.

The principle of the wind tunnel is that air reaction on a given body is identical whether the air is moved past the stationary body at a given speed or whether the body is moving through the air at the same speed (*see* Lesson 1). In other words, the reactions in the tunnel depend only upon the relative motions between the air and the body, provided the air moves steadily and uniformly.

Models of projected aircraft are suspended in the tunnel's airstream from three struts : one attached to each wing tip and the third to the tail. The struts pass through the roof of the

Fig. 71. DE HAVILLAND COMET III AIRLINER. The Comet III was powered by four Rolls-Royce Avon jet engines each developing 10,000 lb. thrust to give a cruising speed of 500 m.p.h. It superseded the Comet I.

tunnel, where they are attached to two balances The struts from the wing-tips are fixed to one balance and that from the tail to the other.

A third balance is attached to a vertical rod which, passing down into the tunnel, is in contact with a horizontal strut fixed to the tail of the model, though it does not bear any of its weight All the balances operate on the principle of an ordinary steelyard, the weight of the suspended model being countered by placing appropriate weights in the scale pans

Models are always suspended upside down in the tunnel in order to maintain a tension on the suspension wires If the model were hung right side up, the lift created by the air stream would act in the opposite direction to the weight on the balances ; and if the lift exerted a force greater than the weights, the suspension wires would become slack, so that the model might swing so violently as to damage itself, the tunnel, and the balances

When the wind is turned on, the thrust of the air stream on the model's tail is transmitted through the vertical rod, and the scale pan of the balance to which the rod is attached tends to rise until it is checked by placing the correct amount of weight in the scale pan. The amount of weight required to keep the beam of the balance horizontal gives the measure of the model's drag.

Simultaneously, the movement of the balances supporting the wing and tail give the lift and pitching characteristics of the model—i.e. its tendency to rotate about its centre of gravity and so throw the nose up or down. By adjusting the tail-plane and elevators of the model, the correct trim can be obtained, so obviating any factors likely to cause a full-scale machine to pitch in flight.

Tunnel tests allow the drag and lift of any proposed aeroplane shape to be accurately measured so that the designer is given the data to evolve the best wing form and fuselage shape applicable to any particular requirement. Vertical wind-tunnels have provided much useful data relative to spinning nose-dives. Light scale models are set spinning in an upward air stream; by adjusting the air speed to balance the model's rate of descent, a technician watching through an observation window in the tunnel is able to keep the spinning model in view and study its behaviour

At a predetermined moment a delayed-action mechanism throws over the controls of the model in the position which should bring the miniature 'plane on to an even keel. In this way it can be determined whether a full-sized machine built to the same design as the model would be easy or difficult to bring out of a spin, or whether it is unlikely that such a machine would recover at all

To study the effects of flight approaching the sonic range, 4,000-h.p high-speed tunnels are used to test models of 6-ft wing span at speeds up to 700 m.p h , and smaller models at speeds exceeding 800 m.p.h.

The Mock-up

It is difficult, even for an experienced engineer, to picture from drawings and plans all the details of a projected aircraft and their relative positions in the completed aeroplane

This is particularly true of the cockpit, where there are a number of controls which must not foul each other, and instruments which must all be clearly visible. Accordingly, a full-size model of the aircraft, called a mock-up, is made quickly and cheaply of wood covered with paper

Fig. 72. AIRCRAFT PRODUCTION. General view of the centre bay of the Bristol Aeroplane Company's assembly hall during production of Britannia airliners. The upper centre section of the aircraft in the foreground is being manoeuvred into position by overhead crane ; an additional panel below the main-plane completes the fuselage shell. As assembly proceeds, the aircraft at the rear of the bay (in the foreground of the picture) move forward to the two intermediate stations in the centre and then to the front of the hall for the final stages of construction.

The mock-up gives a good impression of what the real aircraft will look like, but its main purpose is to try out full-size components as they are designed.

Another advantage of the mock-up is that any mistakes in design can be corrected, and improvements in design made more quickly and cheaply than if they had to be done in the real aeroplane.

Power Units

One of the most important decisions to be made by the designer is the type of power unit to be used on the new aircraft, and upon its choice depends to a great extent the general design of the aeroplane.

Sometimes an aeroplane is designed and then fitted with the most suitable type of engine available, but it is more general practice to design an aircraft with a particular type of engine in view, provided that engine does not entail any radical departure from proved design-technique.

The designer of an airliner has the choice of three types of power unit—piston engine, turbo-propeller, and pure jet. For safety reasons, not less than two engines will be used, whatever the type, while if the aircraft is to serve on routes entailing long sea crossings, four engines are installed. For short services where high speed is not essential an aircraft can be satisfactorily powered by two piston engines, but for express services the tendency is towards the turbo-propeller or pure jet engine.

Contrary to common belief, high-speed flight is not the most important factor in the general design of an airliner and the power plant it uses. Although a pure jet airliner such as the Comet III can fly across oceans and continents at speeds of 500 m.p.h. or more, such jet speeds use up enormous quantities of fuel, and fares must be high if the airliner is to pay its way. People want to travel reasonably fast by air and at fares they can afford. No airline could make a profit by catering for the comparatively few passengers willing to pay for the privilege of flying at 500 m.p.h.

Whereas the four-jet-engined Comet III can carry 40 to 50 passengers at 500 m.p.h., a turbo-propeller airliner such as the Britannia can fly 100 passengers non-stop to a distance of 5,000 miles at a speed of nearly 400 m.p.h. In other words, the turbo-propeller Britannia can be likened to a fast 20-coach train from London to Aberdeen, and the jet-engined Comet III to a non-stop night-coach express from London to Edinburgh.

When the power units have been decided upon, and provided the stress tests of the materials and components, the wind-tunnel tests of the fuselage and wings, and the general layout of the mock-up prove satisfactory, three prototypes of the new aircraft are built. The prototypes are nearly always hand-made by skilled craftsmen in an experimental workshop, which is a miniature factory without the organization of the large-scale production line.

Each part of a prototype is weighed when it is finished, and the drawing office keeps a close watch on the weights and their positions on the aircraft to check the original estimate of the tare weight and position of the centre of gravity.

When finished, the prototypes are weighed in their tare condition, e.g. with all fixed equipment on board, but without fuel, crew, or other disposable load. From this weighing is calculated the position of the centre of gravity. Any major discrepancy between the actual weight of a prototype and the original estimated weight of the aircraft is a criticism of the efficiency of the designing staff.

Of the three prototypes, the first is used for initial test flying, the second for structural testing, the third to try out design changes found necessary during flight tests with the first prototype. The structure-test prototype never flies. Instead, every part of it is subjected to stress tests to ensure that it is strong enough to withstand any strain likely to be imposed on it during the worst possible flying conditions.

While the prototypes are undergoing test, the workshops are being tooled and jigged for mass production. Once the prototype has been passed as satisfactory, work begins on quantity production of the aircraft. With some modifications because of the greater size and complexity of aeroplanes, quantity production of aircraft is on the assembly-line principle used in motor-car factories (Fig. 72).

LESSON 9

Aircraft Instruments

Aircraft instruments are many and various, and their number tends to multiply as aeroplanes increase in size and engine power. But the complexity of the instrument panels in the cockpit of the average aircraft is much more apparent than real; functionally all aircraft instruments belong to one or other of four main groups.

1. Flying instruments, e.g. those concerned with maintaining controlled flight.
2. Navigation instruments.
3. Engine instruments, to indicate whether or not the engines are functioning correctly.
4. Instruments concerned with ancillary equipment, such as undercarriage position indicators, and temperature, oxygen, and other gauges.

This lesson is concerned chiefly with the first

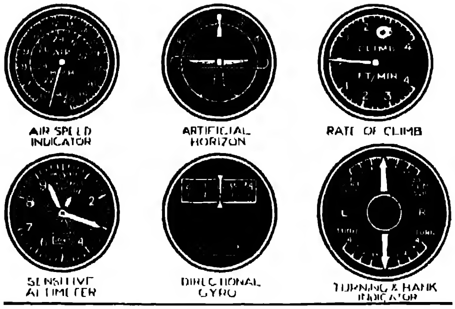


Fig. 73. BLIND-FLYING INSTRUMENT PANEL. The panel is standardised and consists of six instruments mounted in a position directly facing the pilot.

group and only partly with the second group. Groups 3 and 4 consist for the most part of instruments not peculiar to aircraft alone ; and because of their large number they cannot come within the scope of these lessons.

Most important of the flying instruments are the air speed indicator, the artificial horizon, the rate-of-climb indicator, the altimeter, the directional gyro, and the turn-and-bank indicator. With a map and compass a pilot could navigate without any of the foregoing instruments (*see* Lesson 10), but they are essential when darkness or bad visibility prevent his seeing the horizon or picking up landmarks. Accordingly, the six instruments are mounted together and collectively called the blind-flying instrument panel (Fig. 73).

Actuated by differential air pressure, the air speed indicator shows on a dial the speed of the aircraft relative to the air through which it is flying. It takes no account of the movement of the aircraft relative to the ground, and its readings are influenced by the aircraft's altitude and by the weather.

Air speed indicators are operated by the ordinary pressure of the outer air and the additional air pressure induced by the aircraft's forward motion. Consequently, the greater the speed of the aircraft, the greater is the difference between the two pressures and the greater the movement of the needle across the dial.

Ordinary air pressure is obtained from a static head, which consists of a closed tube having a number of slots cut along the sides. Air pressure induced by the aeroplane's forward movement is obtained from a pressure head, which is an open tube of the same diameter as the static head, but without the slots.

The two tubes are mounted together on the leading edge of a wing or some position where they are least liable to be influenced by air disturbances created by the aeroplane. The static and pressure heads are connected by tubing to a flexible diaphragm behind the dial of the recording instrument, the static head going to one side of the diaphragm and the pressure head to the other.

The diaphragm forms one side of a capsule which contracts and expands according to the difference between the two air pressures; whereupon a system of springs and linkages moves a pointer across a dial marked in miles per hour.

Fig. 74 shows diagrammatically a section of the recording part of an air speed indicator, while Fig. 75 is a sectional diagram of the static and pressure heads, or, as they are sometimes called, the pitot head. Static and pressure heads are generally heated to prevent their icing up. Air speed indicators are primarily for giving readings of flying speed, but they are also a basic instrument in air navigation by dead reckoning.

An altimeter is simply an aneroid barometer, and its needle is actuated by the pressure of the air upon a sealed capsule of thin metal. As altitude increases, air pressure round the capsule diminishes, so allowing the air inside the capsule to push the metal outwards. This in turn moves the needle through a spring linkage With decreasing altitude, air pressure decreases and the capsule contracts, so moving the needle backwards. The altimeter normally has three capsules operating three needles across a common dial to give readings in 100s, 1,000s, and 10,000s of feet.

Altimeters measure only the height of the aircraft above sea level, and not the height of the aircraft above the ground over which it is actually flying. An altimeter can, however, be set at zero to register aircraft height above ground relative to the aeroplane's take-off point. A pilot can also zero his altimeter by radio signals according to the height, or barometric pressure, of any airfield over which he is flying. By this means the altimeter will give an approximation of an aircraft's altitude at any particular point on its flight course.

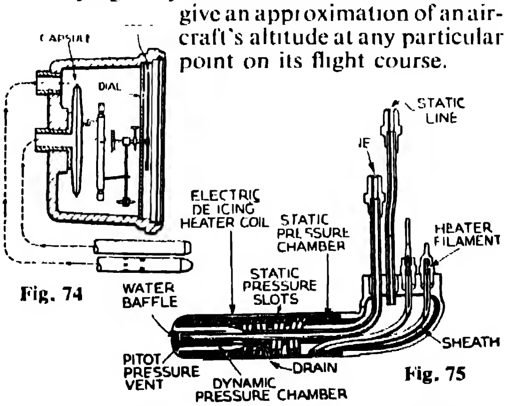


Fig. 74 Fig. 75

Fig. 74 (top left). AIR SPEED INDICATOR. Sectional diagram of recording component of air speed indicator. Fig. 75 (above). Section through pitot head which is electrically heated to prevent icing-up from interfering with its operation.

The function of the artificial horizon is to take the place of the real horizon in bad visibility and so indicate to the pilot the true flying attitude of his aircraft. Across the face of the instrument is a line representing the real horizon and superimposed on this line is the outline of an aircraft's wing. By means of a gyroscope arranged with its axis vertical, the aeroplane image adopts the same position relative to the horizon line on the instrument as the aircraft itself has to the real horizon.

Thus, if the aeroplane image rises above the instrument's horizon line, it indicates that the aircraft is flying nose up. If the right wing of the image is dipping down in relation to the instrument's horizon line, then the aircraft is not on a level keel but is tilted to the right.

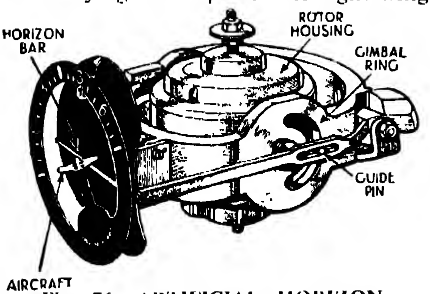


Fig. 76. ARTIFICIAL HORIZON. Operative elements of the instrument that gives the pilot an accurate indication of the flight attitude of his aircraft relative to the horizon.

Like the artificial horizon, the directional gyro depends for its action upon the property of a spinning gyroscope to rotate freely about any axis. The directional gyro, which is controlled by a gyroscope spinning on a horizontal axis, indicates whether or not directional movements of the aircraft controls are responding correctly. A directional gyro is used in conjunction with an ordinary magnetic compass and makes it possible for the pilot to follow a constant course when flying blind.

A directional gyro does not of itself indicate the course on which the aircraft is flying relative to the earth. It can, however, be adapted to maintaining a course relative to the earth by pre-setting it from a magnetic compass reading. Although a directional gyro cannot of itself fly an aircraft on a prescribed course, it is an essential blind-flying instrument.

This is because it is always difficult to alter course by a given amount just by magnetic compass readings, while the magnetic compass is liable to irregularities which make its use difficult in fog and cloud. On the other hand, a directional gyro is constant, and simple to use.

Also operating through the property of a gyroscope, but assisted by a pendulum, the turn-and-bank indicator has two functions; to show the pilot whether the correct amount of bank is being made for a given turn (*see* Lesson 4), and to indicate the rate of turn. The gyroscope of a turn-and-bank indicator is mounted on a horizontal axis, and the readings on the indicator dial are in two parts (Fig. 77.)

The upper part deals with side slip, which is induced by excessive banking, and the lower part with the rate of turn. The upper needle moving across the face of the dial is pendulum-operated and remains central during a correctly banked turn, and registers no difference unless the amount of bank is excessive.

The rate-of-climb indicator is an elaboration of the altimeter and, like it, consists of a thin metal capsule which reacts to decreasing atmospheric pressure as the aircraft climbs to gain altitude. The capsule is connected by tubing to a static head which functions in the same way as the static head of an air speed indicator.

The capsule has a number of very small perforations, so that there is an exchange of pressure between the air in the capsule and the air retained at atmospheric pressure by the static head. The dial is calibrated in feet and minutes, and the exchange of pressure actuates a needle which registers rate of climb at so many feet per minute.

The Machmeter is essential equipment on high-speed aircraft. For every aircraft, irrespective of its design, there is a speed beyond which it cannot fly without risking disaster. An aircraft's maximum safe speed is called its critical Mach number, and is expressed as a decimal fraction of Mach 1·0 which represents the speed of sound. If the speed of sound were constant, instead of falling with altitude, and therefore temperature, an air speed indicator would be sufficient warning to a pilot when his speed was nearing the critical Mach number.

The Machmeter consists of a combination of altimeter and air speed indicator giving a single reading on a dial. As the pressure on the altimeter increases or decreases with the aircraft's changes of altitude a needle moves across the face of the Machmeter dial. The needle is also connected to an air speed indicator, and the mechanism of the altimeter and air speed indicator are linked together. Consequently, the moment the aircraft climbs and flies at a higher altitude, although its forward

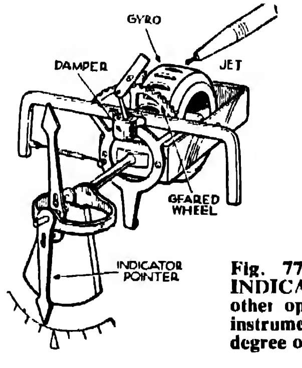


Fig. 77. TURN-AND-BANK INDICATOR. Gyroscope and other operative elements of the instrument that indicates the degree of bank and rate of turn.

speed may be unaltered, the aneroid swings the needle over to indicate a higher decimal fraction of Mach 1, e.g. the speed of sound at that particular altitude. Fig. 78 shows diagrammatically a simple form of Machmeter.

Fundamentally the magnetic compass on an aircraft is the same as that used at sea, but it has many inconveniences, the chief being its liability to deflection by metal in the cockpit. Hence it is common practice to mount the compass in some part of the aircraft well insulated against metal attraction and to have a remote-reading device in the cockpit.

On long flights much of the pilot's work can be relieved by the automatic pilot (Fig. 79), which, like so many aircraft instruments, is based upon the gyroscope. A gyroscope installed in an aircraft with its spinning axis along the fore-and-aft line of the fuselage will, by virtue of its inertia, keep its axis in a constant position relative to the earth.

As explained in Lesson 4, an aircraft in flight has considerable inherent stability, and provided the rudders and elevators are correctly operated by the pilot it is seldom necessary to move the ailerons in level flight. By linking the control surfaces to one or more gyroscopes an aircraft can be automatically kept on a fixed flight path. Most automatic pilots use two gyroscopes, one to operate the rudders and elevators and the other to move the ailerons. The gyroscopes are driven by compressed air projected through jets against the gyroscope

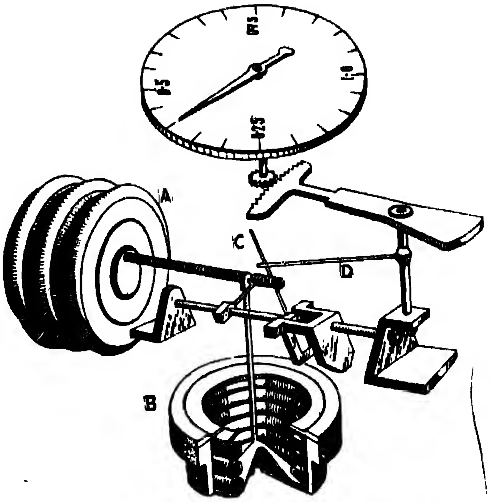


Fig. 78. MACHMETER. Components of instrument that records aircraft speed relative to that of sound at different altitudes. A, evacuated aneroid capsule; B, pressure unit; C, threaded spindle moving backwards or forwards according to concertina action of A. D, spindle moving geared linkage to pointer. Variations of air pressure cause contraction or expansion of A; variations of pressure in air speed indicator expand or contract B.

wheels and revolving them at 10,000 r.p.m

When the aircraft yaws, the stationary portion of the gyroscope moves with it but the spinning portion continues to revolve along the original fore-and-aft axis of the fuselage. This relative movement of the fuselage to the gyroscope causes a small piston attached to the gyroscope to move inside a cylinder and operate a valve which admits oil under pressure to one side of a servo motor linked to the rudder.

This automatically moves the rudder to return the aircraft to its original course. The elevator valve-linkages are so arranged that their movements of the controls are just sufficient to return the aircraft to its set course.

Automatic pilots can be set to maintain an aircraft at a constant altitude or at a constant rate of climb, and they can also be set to act upon radio signals transmitted from the ground. Once an automatic pilot has been set to fly a course it navigates the aeroplane without human agency.

All automatic pilots are so designed and linked to the aircraft's control surfaces that in the event of a breakdown they just fade out, or as it is called "fail safe," so that the aircraft flies by normal stability until the human pilot takes over the controls.

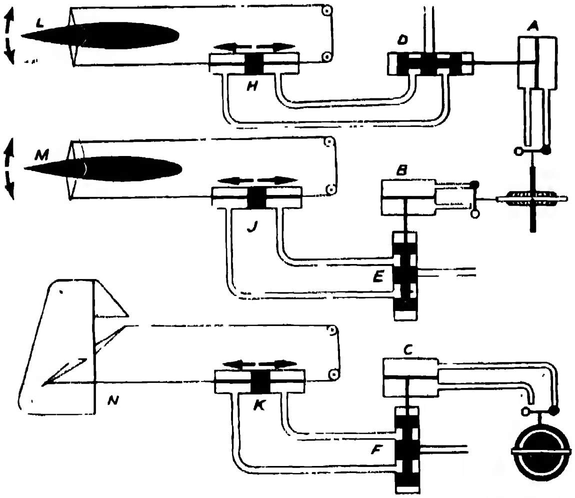


Fig. 79. AUTOMATIC PILOT. The top diagram shows the circuit controlling the ailerons. Gyroscope X admits or shuts off oil under pressure to or from cylinders A, B. This controls movement of balanced oil valves D, E, which operate servos H, J, which are linked to control surfaces L, M, moving the latter according to direction of oil pressure from D, E. The bottom diagram shows rudder control circuit; Y, gyroscope; C, oil cylinders; F, balanced oil valve; K, servo; N, rudder.

LESSON 10

Navigation of Aircraft

NAVIGATING an aircraft is in principle similar to navigating a ship, but is influenced by several differing conditions. Aircraft speeds are much faster than speeds at sea, consequently greater rapidity and accuracy in calculating navigational data are essential. The air navigator does not have to consider dangers comparable with rocks and shoals; consequently the seaman's need for accuracy of position is not so important for the pilot of an aircraft.

A greater degree of accuracy of time is essential in the air. The effect of wind on an aircraft is the same as that of tides and currents on a ship; both produce angles of drift, but with an aircraft a much greater displacement off course is effected in a given time.

Instruments

The chief instruments used in aircraft navigation, several of which have been referred to in Lesson 9, can be grouped under three main heads:

1. Instruments to ensure that a correct course is being maintained. These include a compass, drift indicator, directional gyro, and a calculator for the vector triangle.
2. Instruments for fixing the position of the aircraft. These include a compass for observation of bearings or fixing the direction of objects the position of which is known and recognizable from the map; an altimeter for determining the height of the aircraft above ground level; a sextant for observing the sun, moon, and stars and so fixing geographical position; a chronometer to give the exact Greenwich Mean Time of the astronomical and observational tables.
3. Instruments for determining the distance flown. These include an air speed computor, an air speed indicator, a sight for observation of ground speed. All these, used in conjunction with an altimeter and a height computor, allow the height of the ground above sea level to be arrived at from maps and charts.

Map Reading

In its most elementary form, navigation of an aircraft is the application of map readings and compass bearings. These two fundamentals of navigation are sufficient for even an amateur pilot to find his way on a cross-country flight from a starting point to some quite distant destination. For long-distance, high-altitude flying, navigation is more complex and has become increasingly dependent upon elaborate radio and radar aids.

Although the least skilled method of navigation, flying a course by map needs considerable practice, as the pilot finds his way entirely by landmarks which he must be able to recognize on his map. Only occasionally will he have to use a compass to check direction.

Before taking off, the pilot decides at which altitude and speed he will fly, and also he will obtain as much information as possible about weather conditions, particularly the strength and condition of the wind on his proposed course. The proposed flight track is drawn on the map, additional lines are then drawn five or ten degrees on either side of and from each end of the track line; these lines help the navigator to correct course errors if he finds himself wandering from the flight track.

Another precaution is carefully to study on the map the area bounding the flight track for ten miles on each side, paying particular attention to any hills, masts, or other obstacles. Flying altitude should be fixed to give a clearance of at least 1,000 feet above the highest ground obstacle. Finally, the flight track should be measured with a ruler and the exact distance calculated in miles.

The track is the direct line between starting point and destination, but it is seldom the course, or actual flight course, of the aircraft. The course of an aircraft in flight is the actual direction in which the nose of the machine is pointing, and is referred to as a compass bearing.

Track and course seldom coincide because of factors beyond the navigator's control. The chief of these factors is the wind blowing at an angle to the track, thereby causing the aircraft to drift from the track or to fly faster or more slowly than is shown on the air speed indicator. The track results when aircraft course and speed and the wind strength and direction are interrelated. This interrelation is a triangle of velocities, as shown in Fig. 80.

Supposing a pilot wants to fly from A to B. He draws on his map a straight line from A to B, representing the track of that particular flight. From his meteorological report he obtains the direction and force of the wind at the altitude he intends to fly. This data will rarely agree with the track. Accordingly he draws from B, his destination point, a line B X, representing in units of length the strength and direction of the wind.

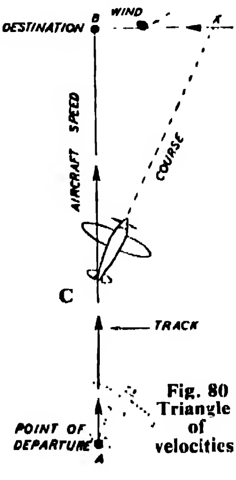


Fig. 80 Triangle of velocities.

If a course has to be steered by magnetic compass, an allowance must be made for the

difference between true north and magnetic north. This allowance can be arrived at from the map and in relation to the year and place of the flight.

Astro-navigation depends upon observations of the sun, moon, and stars for position finding. The observations are made with a type of sextant specially designed for use on aircraft flying at high speeds.

One of the most important factors in aircraft navigation is the difference between air speed and ground speed. When calculating a triangle of velocities, the air speed, i.e. the speed of the aircraft relative to the air, is laid off against the prevailing wind speed, and this gives the ground speed, or the speed of the aircraft relative to the ground over which it is flying.

Just as there are various kinds of compass bearings, so there are various kinds of air speed ; the most important from the navigator's point of view are true air speed and indicated air speed. True air speed is the speed of the aircraft relative to the air through which it is flying, while indicated air speed is the speed registered on the air speed indicator.

Differences between these two air speeds can be substantial and increase with altitude at the rate of 2 per cent. for every 1,000 feet of flying height. Another source of error in navigational calculations for keeping to a flight course is drift, which is the angle between the course and the track and the rhumb line.

Long-distance Navigation

For long-distance navigation, an aircraft can fly on either a Great Circle course or a rhumb-line course. A Great Circle course is the shortest distance between any two points on the world's surface, while a rhumb-line course is one that cuts all meridians at a constant angle. On a chart one of these lines will appear straight and the other curved according to the projection, but over distances up to 500 miles both are nearly straight. In practice it is usual to plot a Great Circle course but to fly along it on a series of rhumb lines.

As in short-distance cross-country flight, long-range navigation is seldom along the shortest distance between two points. Flight is usually along isobars of pressure, so that advantage can be taken from wind direction with a consequent increase of speed and economy of fuel. This method is called pressure pattern flying.

Increasing aircraft speed has greatly complicated the navigator's work, as it drastically reduces the time available to him to make any extensive and detailed calculations. An aircraft flying at 500 m.p.h. travels eight miles in one minute, therefore a position calculation made during flight, which probably takes three minutes to complete, will have an error of 24 miles. Navigation errors on that scale could be serious, as the aircraft might fly off its course to such an extent that it would have insufficient fuel to reach its destination.

Consequently, navigational calculations for long-distance flights at high speed are made, as far as possible, before take-off. While in the air, the navigator must rely on radio and radar for fixes and checks on his course.

Radio Beams

There are a number of radio systems for keeping an aircraft on course, and most of them are based on the transmission of a radio beam from the vicinity of the take-off or destination airports. The beam is picked up audibly by earphones or visually by coloured lights mounted on the instrument panel. If the aircraft deviates from course, the constant sound in the earphones changes to dots or dashes according to whether the deviation is to the left or right of course. If the signal actuates lights, the colours change according to deviation.

Another system consists of radio beams sited on the ground over which the aircraft is flying or on ships stationed on sea stretches of the route. When the aircraft transmits on a certain frequency, the beams transmit back to it, and the strength of the signal indicates whether or not the aircraft is on course. Yet another method consists of a continuous radio transmission from a ground station which controls an automatic pilot on the aircraft to keep it on course.

Other radio aids to navigation show the navigator his position directly on a chart. One of the most efficient consists of signals transmitted from ground stations; these actuate dials in the aircraft, which also has a map on which are curved and coloured reference lines.

The dials are designated red and green and are calibrated to correspond to the coloured and numbered lines on the map. If, for example, the red dial reads 12 and the green dial 30, it means that the aircraft's position is the point on the map where the red line 12 crosses the green line 30. Besides giving the map references, the transmissions drive an automatic plotting machine which traces the aircraft's course continuously on a chart drawn on a narrow strip of paper.

Many large aircraft carry radar transmitters and receivers which reveal on a cathode-ray screen the presence of clouds associated with violently turbulent air conditions. Airborne radar is equally effective in giving warning of other aircraft in the vicinity, and also draws a good " picture " of the ground over which the aircraft is flying. This picture is particularly valuable to navigators flying above low-lying cloud. The radar aids for the safe landing of aircraft at airports when fog reduces visibility are discussed in Lesson 12.

LESSON 11

Civil Aviation

CIVIL aviation is a term that covers all types of flying except military, and it can be divided into club and private flying and commercial flying for profit. The increasing cost of even small aircraft and their servicing severely restricts club flying and limits private flying to a wealthy few.

Moreover, the complexities of to-day's aircraft demand a degree of piloting skill and experience which few amateur pilots have the leisure to acquire. Consequently, civil aviation has become mainly a matter of operating aircraft that will earn revenue from fares, freight rates, and other user charges.

As a medium for the transport of passengers and goods, the air has two great advantages. The first is that it provides a direct main route, free of geographical, but not always national, obstacles, from any one place on the earth's surface to any other place.

The second advantage enjoyed by the air is that it offers less resistance to the passage of a properly shaped vehicle than does the friction of ground or water to the movement of land transport or ships. Hence an aircraft can travel faster than road vehicles, railway trains, or ships, with a resultant saving of time.

Functions

The chief function of commercial aviation is to carry passengers and freights as quickly and as economically as possible consistent with safety. Safety is the overriding factor in commercial aviation, for however fast and cheap air transport may be, travellers will not use it nor business concerns consign their freight by it unless there is reasonable certainty that the journey will be made without mishap.

The safety factor prevented jet propulsion from being applied to commercial aircraft until long after it had become commonplace for military aeroplanes. Similarly, unorthodox wing shapes, like the delta and swept-back, were used on military aeroplanes for years before designers of commercial aircraft considered them.

Payload capacity, speed, passengers' comfort, and economy of operation are the prime considerations in commercial operation, and the civil aircraft must be designed for low operating and maintenance costs. Cheap maintenance means easy maintenance with a consequent reduction in the number of highly skilled and highly paid mechanics, while low operating costs mean economy in fuel. The necessity for safety means that commercial aviation is compelled to make heavy capital investment in radio and radar aids to navigation (Lesson 10), and in the provision of airport and traffic control systems (Lesson 12).

Commercial aircraft can meet their operational and capital costs only if they can attract useful loads, and useful loads are attracted only because of the aeroplane's advantage of greater speed than other forms of transport. It follows that the commercial aircraft must be fast, but how fast depends entirely upon the conditions of the service. The commercial airline operator must have a machine that is fast enough to attract all the available traffic, but as speed costs money the machine must not be faster than is absolutely necessary, for any increase in speed immediately puts up operating expenses.

Ability to use small airfields has become of less consequence in the design of commercial aircraft, because the demand for good performance leads to higher wing-loadings, which in turn increase landing speed and run. That explains the ever-increasing size and cost of airfields and the necessity of siting them away from large cities, where land is scarce and dear. It is because the helicopter (Lesson 7) is independent of runways that commercial aviation is attracted by the possibilities of vertical-lift aircraft.

Passenger Comfort

One of the most important things to consider in commercial aircraft design is passenger comfort ; no matter how fast or reliable the civil aeroplane, it will not attract passengers unless they know they will fly in comfort. The cabin must not be cramped in dimensions, comfortable chairs must be fitted, there must be adequate sanitary and lavatory accommodation, and there must be provision and staff for the serving of light refreshments or full-course meals. Consideration of passengers' comfort also demands that engine noise and vibration must (as far as is practicable) be kept out of the cabin.

Most long-distance airliners have pressurised cabins. The cabins are supplied with air pumped into them at atmospheric pressure and then sealed except for controlled relief valves. Pressurised cabins make it possible for airliners to fly in the sub-stratosphere where there is less liability of bad weather than at lower altitudes ; moreover aircraft driven by jet engines or turbo-propellers are more efficient at high altitudes where there is less air resistance to overcome.

With the introduction of jet propulsion to commercial flying, airliner speed has steadily risen to the 400–500 m.p.h. range, and the size of the aircraft has shown a general tendency to increase. The Boeing Stratocruiser was an outstanding example of how the big high-flying

airliner is the most economical airliner on certain well-patronised routes, such as those across the Atlantic.

The tendency towards large aircraft has resulted in airliners with an all-up weight of 120 tons or more, but it is generally agreed that an airliner such as the Bristol Britannia, which accommodates up to 100 passengers, is the most efficient and economical on the majority of the world's long-distance air routes.

Commercial aircraft are of two basic types : (1) aeroplanes like the Blackburn Universal (Fig. 82) and the Bristol Freighter (Fig. 83), which are specially designed with wide fuselage doors for loading and unloading heavy cargo ; (2) aircraft whose chief purpose is to carry passengers with only limited space for mail and freight.

Passenger-carrying aircraft are further subdivided : twin-engined, moderately sized aircraft for short journeys as from London to the European capitals, and large, four-engined airliners serving long-distance routes involving wide sea crossings.

Airworthiness

Starting point of all civil aircraft requirements is the regulations governing the issue of certificates of airworthiness in the country operating the aircraft. In Great Britain the Air Registration Board lays down the standards of airworthiness, but there are overriding international requirements issued by the International Civil Aviation Organization.

Airworthiness requirements specify the strength of all major parts of the aircraft according to the category of the aircraft. They also call for special provisions relative to structural safety. Thus British requirements insist that the physical properties of aircraft control-linkages shall be such that reverse coupling-up during assembly is impossible.

Before an aeroplane under U.K. control can engage in the carriage of passengers or freight it must be issued with a certificate of airworthiness by the Ministry of Civil Aviation. This C. of A., as it is called, must be renewed at least once a year ; renewal depends on whether the aircraft continues to be in first-class structural condition with efficient engines and instruments.

Whereas it is normal procedure to ground small aeroplanes for a week or so to carry out a complete overhaul before applying for a C. of A. renewal, it would be uneconomical, in view of the loss of several weeks' revenue involved, similarly to ground aircraft of the size of those operated by B.O.A.C., B.E.A.C., and the large charter firms.

The airliner is now comparable with ocean-going ships as far as durability, strength, and resistance to the elements are concerned. It is unnecessary completely to ground an airliner every year, and its certificate of airworthiness is renewed annually provided certain conditions are met. A complete overhaul of the airframe must be made every two or three years according to type. All the principal moving components such as flaps, ailerons, elevators, and rudders must be submitted to stringent examination and test every 18 months or after every period of 3,000 hours flying time.

Hydraulic and anti-icing equipment is overhauled every 2,000 hours. Engines are generally changed after every 1,000 service hours. Instruments must be tested and calibrations checked after 600 hours in the air.

Overhaul periods for components of large aircraft are fixed according to the type of aeroplane and, provided the periods are agreed by the Ministry of Civil Aviation and carried out to the Ministry's satisfaction, the aircraft does not need to be grounded annually for the lengthy period required to make a detailed overhaul of the whole aircraft. In addition, and irrespective of their statutory obligations, responsible operators make careful routine examinations of their aircraft before each flight.

All persons and aircraft operationally employed in civil aviation are registered and licensed by a government department or a body appointed by the government. The issue of licences to pilots and other operational members of air crews is subject to medical examination and the production of a certificate of competency or the passing of appropriate examinations.

Fig. 81. VICKERS VISCOUNT. The world's first turbo-prop. airliner, this outstanding British-built aircraft went into service with B.E.A.C. in 1953. It is powered by four Rolls-Royce Dart engines each developing 1,490 h.p. plus 360-lb. jet-thrust. The Viscount accommodates 82 passengers, and has a speed of 350 m.p.h., with a range of 2,000 miles.

Conditions governing the issue of a transport pilot's licence are much more stringent than those governing the issue of a private pilot's licence. Licences issued in civil aviation to air crews in the United Kingdom are : pilot student, private, commercial, senior commercial, airline transport ; flight navigator ; radio ; flight (aircraft, or operational) engineer.

Various licences are also issued to ground (maintenance) engineers as follows : A. inspection of aircraft before

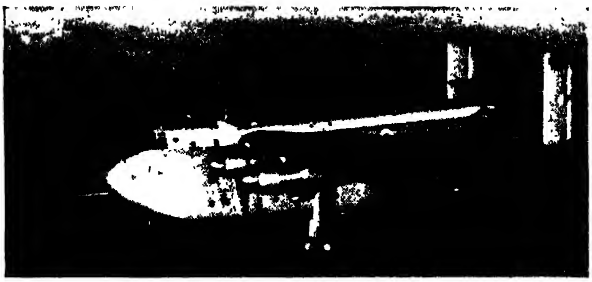


Fig. 82. BLACKBURN FREIGHTER. Able to lift a cargo of 20 tons, this flying freighter is powered by four 2,850-h.p. piston engines and has a speed of 245 m.p.h. and a range of 900 miles. Cargo is loaded through a door at the rear of the fuselage below the tail boom.

flight; B. inspection of aircraft after overhaul; C. inspection of aero-engines before flight; D. inspection of aero-engines after overhaul; X. special duties.

The Royal Aero Club aviator's certificate is a certificate of competency in the pilotage of a heavier-than-air aircraft. It is issued by the club under the regulations of the Fédération of Aéronautique Internationale, and is accepted by the Ministry of Civil Aviation as a certificate for the issue of a pilot's licence.

By the terms of annex A of the International Air Navigation Convention of 1919, which was redrafted in 1949, all civil aircraft must bear a standardised identification mark in the form of a series of alphabetical letters. The first letter or letters of the group indicates the nationality of the aircraft and is followed by a hyphen, which is in turn followed by a further group of letters indicative of the national registration of the particular aircraft.

Finance

Unlike transport by road, rail, and sea, which developed commercially on private capital and with mail contracts as their only government support, commercial aviation in nearly every country depends for its existence on some form of government assistance. The air services, except for a few restricted charter companies, can be nationally owned, as in Great Britain, France, Italy, Portugal, Spain, Canada, Australia, New Zealand, South Africa, and most South American states. Other countries give their airlines lavish subsidies and meet the costs of airports and of radio and meteorological services.

Consequent upon government support, commercial aviation has in most countries expanded more rapidly than its financial results could have justified had it been self-supporting and obliged to balance its budget. As a result, commercial aviation throughout the world is from a business point of view financially unsound. The U.S.A. is one of the few countries with a self-supporting commercial air service. Even in the U.S.A. only about half of the operating companies show a profit from passenger and freight charges; the remainder are solvent only because of their mail subsidies.

Commercial aviation enjoys its greatest advantages in attracting passengers and freight traffic over territories where other forms of transport are poorly developed—Canada, Australia, Brazil, China, and Russia. Countries of large area generally concentrate on operating commercial aircraft on an internal network of routes in direct competition with their road and rail system.

Smaller countries, like Great Britain, the Netherlands, Belgium, and France, which have highly developed road, rail, and water transport linking the comparatively short distances between their main centres of population, tend to develop internal and overseas air services.

Air transport charges are in general considerably higher than those of surface transport, but the payment of a premium for the greater speed and convenience of air transport is accepted as reasonable. The result is that the airliner offers a more frequent service and is therefore of great convenience to the traveller.

U.K. Position

At the end of the Second World War the U.S.A. led the world in civil aviation. Unlike that of the U.K., the U.S.A. aircraft industry, although primarily developed for the production of warplanes, had devoted part of its energy to the building of civil aircraft. The U.K. industry virtually stopped building civil aircraft during the Second World War, and any developments in that direction were incidental sidelines to its prime function of war production.

For some years after the Second World War the U.S.A. provided most of the commercial aeroplanes serving the world's air routes. This

Fig. 83. BRISTOL FERRY. Loading one of the Bristol Freighters that ferry vehicles between England and France. The fuselage can accommodate three motor cars.

was because the U.S.A. had civil aircraft built and ready for service immediately the war ended. Even more important, she did not have to depend on overseas markets to absorb the bulk of her civil aircraft production ; the great distances in the U.S.A. provided domestic routes over which large airliners could operate profitably.

The U.K. is a much smaller country in area, and there are few non-stop trunk routes over which large aircraft can operate economically Consequently all large civil aircraft built in the U.K. must be flown on Commonwealth and overseas services.

Relatively, British commercial aircraft cost more to provide than those built in the U.S.A., and it was only British technical superiority, particularly in the development of the jet engine and the turbo-propeller, that made it possible for the U.K. to compete with the U.S.A. on approximately equal terms.

LESSON 12

Airports and Traffic Control

Any level grass field served as an airport in the days when the aeroplane's all-up weight seldom exceeded 6,000 lb. and landing speeds were in the 50–60 m.p.h. range. But with the development of large, multi-engined airliners having high landing-speeds, longer and stronger runways became necessary.

These eventually progressed into thick concrete runways up to 10,000 ft. in length and able to withstand the landing impact of aircraft with an all-up weight of 250,000 lb. or more.

Runway Patterns

Small airports often consist of a single runway sited in the direction of the prevailing wind and with a control tower and administrative buildings grouped at one side of it. Airports dealing with heavy traffic require several runways, and these are laid out according to a recognized pattern. The triangular pattern has its longest runway in the direction of the prevailing wind. Terminal and administrative buildings are generally sited on the outer edge of the main runway and the whole pattern of runways is surrounded by a perimeter track along which aircraft taxi between runways and landing bays.

Where traffic is particularly dense at an airport with a triangular pattern of runways, one or other of the runways is duplicated with a parallel runway. A good example is London Airport, where the runways are in the pattern of two triangles, one superimposed on the other.

This arrangement gives London Airport six runways laid in parallel pairs in each of three directions. The main runways run east and west and are : No. 1, 9,280 ft. long, and No. 5, 9,504 ft. long. No. 4 is the shortest and is 5,798 ft. long. With the exception of Nos. 4 and 6, which are 250 ft. wide, the runways are each 300 ft. in width.

From the triangular pattern of runways developed the parallel arrangement. In both the double triangular and the parallel patterns, the main airport buildings and control tower are sited in the centre of the pattern and reached by a tunnel leading from the airport approach roads.

The runways of an airport can be laid on what is called the tangential pattern. The aerodrome buildings, offices, customs and passport inspection rooms, and loading and unloading bays, are grouped in a central area from which the runways extend tangentially. By this system all the runways touch on the central area but they do not at any point cross each other. Consequently, aircraft landing or taking off simultaneously or at short intervals have maximum separation from each other and therefore minimum risk of collision

Other advantages of the tangential pattern are that there is always at least one runway available irrespective of wind direction, and aircraft spend the minimum time taxi-ing for take-off.

Focal point of an airport is the control tower from which the movements of all aircraft in the airport or flying in its vicinity are directed. At particularly busy airports control is divided into two sections, each under a controller.

One looks after "live" aircraft taking off or landing, and the other controls taxi-ing aircraft and vehicles in the manoeuvring area. The control building is usually in the form of a tall tower with large windows giving the staff a good view of all the runways.

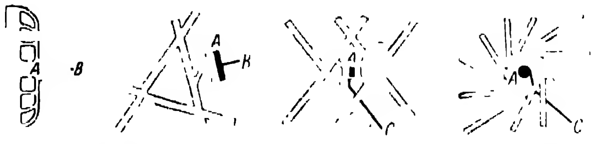
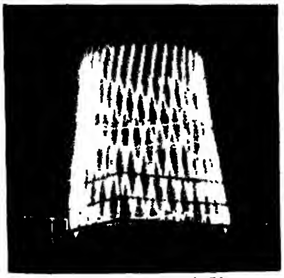


Fig. 84. RUNWAY PATTERNS. Left to right : Single runway sited in direction of prevailing wind. A, terminal buildings ; B, approach road. Runways laid out to form a triangle, with longest runway in direction of prevailing wind. A, terminal buildings ; B, approach road. Four runways laid in parallel pairs. A, terminal buildings ; C, tunnel from approach road. Twelve runways laid out tangentially from terminal buildings (A), which are reached by an approach road (C) passing through a tunnel under one of the runways.

Complementary to the control building is the runway control van. This is painted orange and white and stands beside the runway in use. The duty of the control van staff is to report by radio or telephone to the control tower any unusual happening on the runway, to measure runway visibility and, in emergency, to fire Very lights as a guide or warning to aircraft about to land or to take off.

In daytime, normal aircraft movement is directed from the control tower by radio telegraphy or radio telephony. Pilots of incoming aircraft are instructed by radio as to which runway they are to land on, and when, and the control staff are responsible for ensuring that that particular runway is clear before giving permission to land.



General Electric

Fig. 85. Identification beacon at boundary of London Airport. Lighting is by discharge lamps which flash in Morse the airport's code letters.

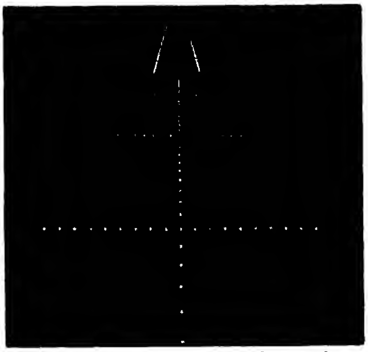


Fig. 86. Low intensity line-and-bar approach lighting at London Airport. In the distance are the parallel lines of lights marking the lateral boundaries of the runway.

In the event of no runway being available when an aircraft asks permission to land, the pilot is told to circle the vicinity of the airport at a certain altitude until a runway is available. When several aircraft are circling at different altitudes the procedure is called "stacking."

Aircraft about to take off are directed to a vacant runway and then signalled into the air either by radio or visually.

Lighting Systems

Elaborate and foolproof lighting systems are essential to the night operation of an airport. Night identification of an airport by an incoming pilot is by two powerful electric beacons. One, some miles from the airport, flashes alternate white and green, the recognised sign that a civil airport is near by. The second, Fig. 85, sited just beyond the airport boundary, flashes in Morse the alphabetical letters of the airport's code signal.

Various lighting systems are used to guide the incoming pilot on to his runway. One of the most efficient is the Calvert, or Line-and-Bar approach, Fig. 86. It consists of a centre line, 3,000 feet long, with cross-bars at intervals of 300 feet. The line and cross-bars are picked out in electric lights, and in good visibility use red lamps. In poor visibility the centre line is in white lights and the cross-bars in yellow lights. The last bar of lights is in green, irrespective of visibility, and marks the beginning of the runway approach. The various coloured lamps are arranged so that their combination can be changed or the whole system switched on and off from the control tower.

The last bar of light of the Calvert approach-lights marks the beginning of the actual runway. From the arrangement of the pattern of lights as he sees it the pilot can tell whether his aircraft is banked or displaced laterally. By keeping the nose of the aircraft on the centre line of light he is sure of touching down on the centre of the runway.

Aircraft taxi-ing at night are guided along the runway approaches and the runways themselves by following green lights sunk into the centre of the approaches and runways and operated from the control towers. To avoid confusion these lights are switched on for the runway actually in use. The runways are divided into "blocks" with controllable "stop" bars of red lights at the end of each block. In daylight the route to be followed by aircraft moving on the ground is indicated by lights on numbered boards.

Instrument Landing System

At most large airports visual lighting for guiding incoming aircraft on to the runways is supplemented by the radio Instrument Landing System, which is approved and recommended by the International Civil Aviation Organization. The system provides approach direction to the airport plus a glide path to assist safe descent, and marker beacons to indicate to the pilot his distance from the approach end of the runway. Four separate radio transmitters are needed to operate the system.

Indication to the pilot of the position of his aircraft relative to the required approach path to a runway is by two cross-pointers moving over a dial (Fig. 87) mounted on the aircraft's instrument panel. The movement of the pointers is actuated through relays by radio impulses from a ground station.

When the aircraft is at the correct height and course for approach, the two pointers intersect at right angles at the centre of the dial. If the intersection is not at the centre of the dial, the pilot takes correcting action by turning his

aircraft in the direction of the intersection as seen from the centre of the meter, the object being to get the pointers centralised.

Besides the course and altitude applicable to preparing to land on a runway, the pilot must know his distance from the correct point for touch-down at the beginning of the runway. This information is provided by two marker

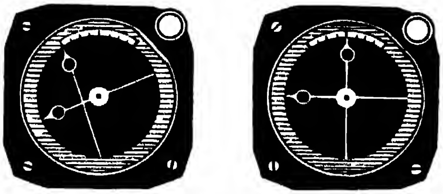


Fig. 87. INSTRUMENT LANDING SYSTEM. Dial giving pilot visual indication of his position relative to runway. Left, aircraft off course; pointers do not intersect at right angles. Right, aircraft at correct height and course for touch-down: pointers intersect at right angle. Movement of the pointers is by radio impulse from a ground station.

beacons: one, the outer beacon, is sited some four miles from the approach end of the runway but in a direct line with it. The second beacon, called the middle marker, is sited 3,500 feet from the approach end of the runway and in line with it and the outer beacon.

Both beacons are, in fact, radio transmitters, and transmit identifying signals. The outer beacon's signal is a series of dashes, and that of the middle beacon is a series of alternate dots and dashes.

Both transmissions are beamed, that is, they can be picked up by the aircraft's receiver only when the machine is actually flying along the line of transmission. Consequently, when the pilot hears the signals he knows that he is in the right direction of approach to the runway. Thereafter he comes in to land guided by visual means, one being the Calvert system already described.

Ground Control Approach

The Ground Control Approach is used to land an aircraft when bad visibility obscures the runways from the pilot's view, and is so called because the operator on the ground controls the course of the aircraft as it approaches the airport. No equipment is necessary on the aircraft to respond to Ground Control Approach, the whole system being operated from the airport by a radar transmitter-receiver, which is generally installed in a motor van so that it can be moved from runway to runway.

Immediately visibility falls below a certain distance the operator in the van begins to transmit radar impulses. The aerial is constantly revolving and as the transmitter has a range of 30 miles it covers a distance of 30 miles in any direction from the airport. When the radar beam makes contact with an approaching aircraft, the impulses are reflected back and cause a continuous spot of light to appear on screens, rather like those of television receivers, mounted in the van.

One of the screens has a transparent graph across its face marked in heights by thousands of feet, and from this the operator can at once see how high the aircraft is flying. Another screen has marked round its circumference the points of the compass. This second screen also has a number of concentric rings, each spaced to represent a distance of five miles. The position of a "blip" which the second radar echo causes to appear on the screen, tells the operator the course of the aircraft and its distance from the airport.

Because every aircraft produces a similar radar "blip" on the screens, the G.C.A. director must identify the aircraft and establish whether or not the pilot wishes to land. Identification is established by a radio signal to the pilot asking him to turn his aircraft so that it can be seen if a particular "blip" carries out a corresponding manoeuvre on the screen.

Having identified the aircraft, the controller radios instructions to the pilot as to the course he must fly to reach the airport. Thereafter the controller follows the flight of the aircraft as indicated by the movement of the "blip" across the radar screen, and from the position

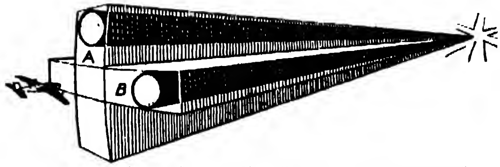


Fig. 88. GROUND CONTROL APPROACH. Schematic diagram of G.C.A. radar transmissions; A, elevation beam; B, azimuth, or lateral beam.

of other moving "blips" is able to direct the incoming pilot to steer clear of other aircraft in his vicinity. When the approaching pilot is at a position 10 miles from the airport, he is radioed the direction of the runway on which he is to land and when to begin gliding in.

By means of a chart of the runway superimposed on a third screen and over which moves a radar "blip" the controller instantly knows if the aircraft is flying on the right course. If the pilot is off course he receives radio instructions to change direction until the "blip" is again moving to show that the aircraft is flying directly towards the runway and at the right angle to land on it.

In this way the aircraft is constantly in radar "view" until the pilot has the wheels of his aircraft safely on the ground. Fig. 88 shows in diagrammatic form the operation of Ground Control Approach.

To avoid risk of collision between aircraft in flight, the air space over Great Britain and Northern Ireland is divided into four flight information zones, and near large airports these four zones are subdivided into seven control zones. The movement of aircraft is controlled from three traffic centres: London, for South-east England; Preston for the Midlands; Prestwick for Scotland and the North of England. From the control zones radiate a network of airways, or flight corridors, each ten miles wide.

Civil aircraft must fly within these corridors at fixed heights of between 3,000 and 11,000 feet according to the direction and type of aircraft, and the flight paths are so allotted that there is a safety separation of 500 feet between the flight paths and there must be an interval of ten minutes between aircraft using the same flight path. At the same time the aircraft are under strict ground control by radio to ensure that they are keeping their correct course and altitude. Each flight path is divided into sections by ground radio beams, and near major airports there are air spaces, or "waiting" areas to which aircraft are directed for "stacking" until they can land.

Radar Monitor

The heaviest civil air traffic over Great Britain is within a radius of 130 miles of London Airport, and as a further safeguard the air corridors are supplemented by a long-range radar unit operating from London Airport. The unit, called London Radar, can track 30 aircraft an hour up to a maximum distance of 130 miles in all directions and monitor their progress. Aircraft coming into London Airport in bad visibility are picked up by the unit and transferred to Ground Control Approach for landing. The unit also provides pilots with information on the location of storms and cloud.

LESSON 13

Safety Equipment in Aircraft

SAFETY devices in aircraft are of two kinds, personal and structural. Personal devices include parachutes, life-jackets, dinghies, and safety belts. Structural equipment includes de-icing and equipment for fire-detecting and fire-fighting.

Parachutes are not carried on civil airliners because such aircraft are built to a high degree of safety, and the presence of parachutes on board would have the psychological effect of persuading passengers that travel by air is dangerous. Moreover, to drop from an aircraft by parachute requires training and practice such as very few passengers have had or would care to acquire.

Airliners flying passengers across long ocean stages are under legal obligation to carry sufficient lifejackets for all on board, and these must be stowed so that they are readily accessible to individual passengers. The lifejackets are equipped with self-contained lamps and phials of yellow dye to stain the water and so act as a guide for aircraft searching for survivors from an airliner forced into the sea.

The dinghies are of rubber and are self-inflating when thrown into the water. Every passenger seat in an airliner must be provided with a safety belt, and passengers must understand how to buckle these on at take-off and landing—the two critical periods of flight. The belts prevent the wearer from being thrown forward and receiving injuries by being pitched against the backs of seats if the aircraft crashes.

Experience from crashes has indicated that the conventional and popular passenger seat facing the nose of the aircraft is not always the safest in the event of accident, as the occupants tend to be thrown forward. Although it is beyond dispute that rearward-facing seats have saved many lives in military aircraft crashes, the majority of travellers dislike sitting with their backs to the direction in which they are going. Rearward-facing seats are now standard on all military transport-aircraft.

A parachute is simply a huge umbrella which, because of its large surface area, offers great resistance to the air with a human body attached to it. There are two kinds of parachute: the manual for baling out of aircraft flying at speeds up to 400 m.p.h.; and the ejector for escaping from aircraft flying at speeds exceeding 400 m.p.h.

Made from pure silk or high-quality nylon, the canopy of the manual parachute is 24 feet in diameter when opened, and it gives a surface area of 62 square yards. The canopy consists of a number of small panels, so that if it should tear during its opening or during descent the damage will not spread.

Evenly spaced around the circumference of the canopy are 26 silk or nylon cords called shrouds, and these meet at a point some distance below the opened canopy, where they are attached to a ring, which is in turn fixed to the wearer's harness. On top of the canopy is a small pilot parachute which opens first and helps to pull the main parachute out of its pack, so preventing the large canopy and its shrouds from becoming entangled.

Canopy and shrouds are folded into a pack or valise, 18 inches square, which is attached by long straps of webbing to a harness passing

between the legs and over the shoulders of the wearer. The folded parachute is held in its pack by a flap closed by two pins running through slots. Attached to each pin is a steel wire, called the rip cord, connected to a handle on the left-hand side of the wearer's belt. The packed parachute weighs 18 lb

When he jumps, the parachutist counts three to give himself time to fall clear of the aircraft, and then pulls the rip cord, so jerking the pins out of the slots in the pack. The flap then opens, and the small pilot parachute, held in the pack by compression springs, is forced out and pulls after it the main canopy, which fully opens in 1½ seconds.

As the parachutist falls under the attraction of the earth's gravity, an upward pressure of air is induced below the canopy and causes it to fill with air and spread out like an umbrella. The upward pressure of air inside the canopy acts as a brake and slows down the fall of the parachute and the man suspended from it. Part of the upward rush of air against the surface of the parachute escapes through a vent in the top of the canopy, so that in effect the parachute slides down a column of comparatively still air.

A parachute normally falls at a rate of approximately 20 feet a second, and by pulling on the shrouds the parachutist can exercise some control over its direction.

Ejector Parachute

With the development of high-speed jet-engined military aircraft, it was found that airmen obliged to use the ordinary type of parachute had difficulty in getting clear of the aircraft before the canopy opened. This was because the aircraft's speed created an air suction which dragged the parachutist towards the aircraft. That difficulty was overcome by the ejector parachute, in which the airman's seat forms part of the parachute and runs on rails behind him (Fig. 89, B). Near the bottom of the seat is an explosive charge and just above his head is a handle.

Pulling down the handle draws a curtain over his face to protect him against the slipstream and at the same time releases a trigger to explode the charge. He is thereupon shot with his seat clear of the aircraft at a speed of 500 m.p.h. Once he is thus cleared from the aircraft the seat falls away, and an ordinary parachute automatically opens to float him to earth (Fig. 89, A).

De-Icing

Certain cloud conditions and low atmospheric temperatures cause ice to form rapidly on aircraft surfaces meeting the full impact of the air stream. This is particularly liable to occur on the leading edges of the wings and airscrew blades, and, with jet aircraft, around the air intake of the turbine. Not only do such conditions appreciably increase the aircraft's weight but they upset the aeroplane's aerodynamic contours. The culminating effect is to reduce lift and increase drag to a degree when the aircraft may be forced down.

Icing problems can be solved in one of two ways: by installing equipment to prevent ice from forming, or by allowing it to form, then removing it before it reaches serious proportions The first method is to coat the surfaces with an anti-freeze paste, or to pump over them during flight ethylene glycol or some other anti-freeze liquid. It is more usual, however, to remove ice as it forms.

This can be done by fixing a flexible hollow rubber mat over the leading edges of the surfaces, and pumping air through the mat so that it is alternately inflated and deflated. The flexing of the rubber cracks the forming ice and loosens it sufficiently for it to be carried away by the air stream and dispersed before the accumulation can become really serious.

Another method, and one generally used, to de-ice airscrews, is to fit a strip of electrically

Fig. 89. A. EJECTOR PARACHUTE. Main parachute opening as pilot drogues, which pulled it from its pack, open. B. Pilot seated in ejector parachute and pulling face curtain which automatically fires charge that shoots him from cockpit.

conductive material along the leading edge. Passing an electric current through the conductive material melts the forming ice and leaves on the surface a thin film of water, so that the ice slides off the blades by the centrifugal force induced by their rotation.

Sometimes the leading edges of the surfaces have a double skin through which hot air is forced by pumps from heaters. In jet aircraft, hot air from the turbine compressor is diverted through the double skin to meet forming ice.

Ice forming on the air-intake of a jet engine will, if it breaks away, be liable to be drawn into the compressor and damage it. Hence the ice must be prevented from forming at all. This is often done by electro-thermal equipment that keeps the leading edge of the air-intake at a temperature too high for ice to form there. The de-icing surface consists of light-alloy elements embedded in vulcanised rubber. A similar type of heater is used to clear rudders and other control surfaces which can jam because of ice formation.

Because of their inflammable fuel, particularly with piston engines, aircraft have a high fire-risk. Engines are always separated from the rest of the aircraft by steel, fireproof bulkheads, while extinguishers are so mounted beside the engine that pressing a button in the cockpit smothers it with foam in the event of fire. Freight and baggage compartments have equipment that floods them with carbon-dioxide gas if fire breaks out. Temperature-sensitive devices mounted in the engine housings and the fuselage give visual warning when fire starts anywhere in the aircraft.

LESSON 14

Gliders and Sailplanes

GLIDERS and sailplanes are simply aeroplanes without any means of mechanical self-propulsion; and because control of their movement when airborne is by taking advantage of winds and air currents, flying them has been called yachting in the air.

The difference between the glider and the sailplane is that the former is built on comparatively elementary aerodynamic lines and, as its name implies, is intended for short gliding flights. The sailplane is a high-performance aircraft so designed that in the hands of a skilled pilot it is sensitive to control and able to make long-distance flights.

Although similar to powered aircraft in their basic principles of design and construction, gliders and sailplanes have slight modifications because of the different flight conditions created by the absence of a power unit. Like an aeroplane, gliders and sailplanes are controlled in flight by rudder, ailerons, and elevators, operated by a control column and rudder bar.

Because gliders and sailplanes have low landing and flight speeds, do not have to support concentrated loads, and are free of engine vibrations and torque, stresses are much lower than those affecting powered aircraft. Consequently the structure of unpowered aircraft can be of thin and light materials. The wings and fuselage usually consist of a wood framework or skeleton covered with a skin of birch ply, while the movable control surfaces have a similar framework covered with fabric.

A single spar is sufficient for the thick-section wings, which are generally of cantilever construction in sailplanes. Glider wings, however, are more often of a simple two-spar construction with strut and wire bracing.

As neither gliders nor sailplanes need ground clearance for airscrews, undercarriages are either stub wheels or skids. Consequently the fuselage is close to the ground and the wings must be mounted high to avoid obstruction on take-off or landing.

To reduce drag interference between fuselage and mainplane, a gull wing is often chosen with considerable dihedral at the root and practically straight outboard. The most efficiently designed

Fig. 90. GULL WING. This wing shape is often chosen for gliders and sailplanes because it reduces wing and fuselage interference. A and B are air brakes which retract when not in use.

sailplanes also have air brakes fitted above and below the wing. The brakes are in the form of slats which can be swung out of recesses to reduce lift and increase drag, thereby steepening the angle of glide when landing (Fig. 90).

Gliders are extremely simple in construction, and in many of them the pilot sits in front without any covering, but sailplanes have orthodox fuselages with an enclosed cockpit. The sailplane generally has a smaller wing span than the glider, and a heavier wing loading. Stalling speed is in the region of 30 m.p.h.

Gliding flight is divided into three progressive categories : ordinary gliding, soaring, and sailing. The first two stages must be mastered before long cross-country flights can be undertaken.

Gliding, or air tobogganing as it has been aptly called, gets the pilot accustomed to the feel and control of engineless aircraft. The elementary type of glider used is not meant to

remain in the air for any but short periods. The glider is launched from the top of a slope and descends with a slow forward speed and a coarse angle of glide.

After several gliding flights, the lengths of which are gradually increased, the pilot passes on to the soaring machine, in which he learns to make a series of glides without touching the ground between them. He then graduates to the sailplane proper.

Sailplaning

For maintained motorless flight without loss of altitude, ascending air currents are essential, and it is by taking advantage of these currents that the sailplane pilot remains airborne. Ascending currents are encountered over the windward slopes of hills (Fig. 91). Wind passing over rising ground is deflected upwards to flow over the obstruction. Down wind, the air current falls again and becomes turbulent.

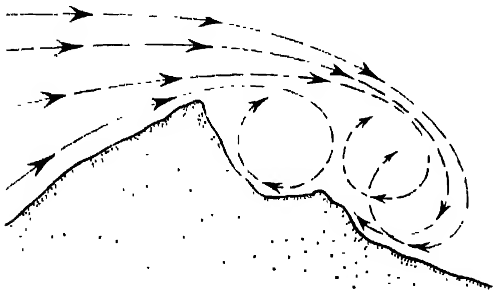


Fig. 91. AIR FLOW OVER HILL. Type of airflow over the top of a hill in the direction shown by arrows. On the right of the hill is the upward current, which gives a glider lift.

The higher and steeper the hill, the greater is the upward current of air, which often extends hundreds of feet above the crest of the hill itself. The sailplane pilot allows his machine to be carried upwards by the rising current and then glides down again with the falling current : this gives him sufficient momentum to carry him up again when he raises his elevators. In this way he can glide or soar from hill to hill.

Other sources of sailplane lift are provided by the sun's heating of the surface of the ground and also of the air above it. Because of the property of convection, heated air always rises, and induces the rising currents of warm air called thermals. Some surfaces, e.g. lakes and tarred roads, produce exceptionally good thermals because they absorb heat.

An experienced pilot can detect the presence of up-currents by clouds, which are mostly formed by the condensation of moisture in the warm rising air as it enters colder layers. When making long-distance sailplane flights, the pilot guides his aircraft from cloud to cloud and from thermal to thermal. The necessary height is gained by circling in a rising current.

When sufficient altitude has been obtained, course is set on a straight descending glide to where a cloud or other indication of an upward current can be seen. In this way sailplanes have made flights of over 500 miles.

Sailplanes can be launched into the air by manpower, by wind, or by towing. Manual launching is by using a length of elastic cord arranged in the form of a V with its apex attached to a hook in the nose of the fuselage. The ends of the cord are held by a ground crew who stretch the cord while the machine is being held back. When the elastic cord is sufficiently taut, the sailplane is released and catapulted into the air.

Sailplanes are winch-launched by attaching the aircraft to the end of a cable wound on the drum of a power-driven winch. When the winch hauls in the cable, the sailplane is pulled forward and upward at a steep angle like that of a kite. Immediately the release height is reached, the pilot levels out and casts off the cable by means of a quick-release hook.

Towed launching is by motor car or by powered aircraft. When towed off the ground by an aeroplane, the sailplane becomes airborne first by reason of its low stalling speed, and remains above the aeroplane, which usually tows at a speed of 70 m.p.h. Immediately the desired altitude is reached, the sailplane pilot casts off and continues his flight by making for the nearest upward air currents.

LESSON 15

Military and Naval Aircraft

MILITARY aircraft—and for the purpose of this Lesson military includes naval—are of two main groups, bombers and fighters. The bomber is invariably used in an offensive role, its chief functions being to destroy the enemy's troop, armour, transport, and supply concentrations ; to disrupt his road, rail, and sea communications ; and to immobilise his factories, power plants, and other sources of war potential. The fighter has two distinct duties : to defend its own bombers, and to take the offensive against enemy bombers.

Between the bomber and the fighter are a number of subsidiary groups ; fighter-bombers, torpedo-carriers, photographic reconnaissance aircraft, aircraft for army co-operation and

artillery spotting, patrol flying-boats and transports. Fighter-bombers, torpedo-carriers, and photographic reconnaissance aircraft are closely related to the fighter in size and speed.

Army co-operation and artillery-spotting aeroplanes are comparatively slow and have a low stalling speed; indeed, their duties can often be efficiently carried out by helicopters. Transports and patrol flying-boats are large, heavy aircraft closely related to the bomber. With the exception of army co-operation aircraft, artillery spotters, and flying-boats, nearly all military aeroplanes are either jet-propelled or driven by turbo-propellers.

Bombers

Bombers are of two categories, medium and heavy. Medium bombers are usually fast, comparatively small aircraft designed for short-range bombing of ships and land targets. Typical of Royal Air Force medium bombers is the English Electric Canberra. The Canberra, which was the first R.A.F. jet-propelled bomber, is a dual-purpose machine, for besides operating as a bomber it can be equipped with a heavy forward-fighting armament of guns or rockets for night intruder attacks on enemy airfields.

Heavy bombers are designed for long-distance bombing of targets deep in enemy territory. Like the Avro Vulcan, heavy bombers usually have four engines and fly and bomb at high altitude. Until immediately after the Second World War bombers were heavily armed with cannon and machine-guns as protection against enemy fighters. But with the development of jet propulsion bombers increasingly rely on their high speed for protection.

They are able to carry an exceptionally heavy load, including atomic bombs and guided-missiles with atomic warheads. Much of their fixed load consists of elaborate electronic and radar equipment for navigating and for high-altitude bombing through cloud.

Fig. 92. AUSTER A.O.P. MARK 9. Designed as an artillery-spotting aircraft, the Auster A.O.P. is powered by a 173-h.p. Cirrus piston engine and has a maximum speed of 127 m.p.h. Its deep wing gives it low landing speed so that it can operate from small, makeshift airfields or airstrips.

With the exception of night fighters, which are manned by a pilot and by an observer-navigator who looks after the radar installation, fighters are usually single-seaters. Consequent upon the high speeds derived from jet-propulsion, fighter design has been distinguished by revolutionary advances in wing shapes. Typical military aircraft of the mid-20th century are illustrated on p. 1032.

Notable examples in the 1950s were the Gloucester Javelin and the Hawker Hunter. Fighters carry a heavy armament of cannon and have speeds closely approaching that of sound.

Fighter bombers are enlarged versions of fighters and are armed with bombs and rockets for attacking battlefields and back area targets.

Most naval aircraft are of the fighter and fighter-bomber type, but modified for taking off from, and landing on, the restricted area of an aircraft-carrier flight deck. Naval aircraft have large-area air-brakes to reduce their landing run and folding wings for easy stowing of the machine in the below-deck hangars. Carrier-borne aircraft are armed with cannon and torpedoes, bombs, or depth-charges. Typical naval aircraft are the Hawker Sea Hawk and the Supermarine Attacker.

Photographic reconnaissance aircraft are mostly in the fighter class as regards size and speed, but specially adapted to accommodate photographers and heavy camera equipment. On some machines the photographing of ground objects is entirely automatic, the cameras being under the control of the pilot.

Army Co-operation

Army co-operation aircraft, as their name implies, work with the army and are mostly comparatively slow, piston-engined machines specially designed for operating from makeshift airfields. Their chief characteristic is a low landing speed and wide-area air-brakes. The wing is always mounted well above the fuselage to give the observer a good all-round view (Fig. 92).

Artillery spotting aircraft are basically of similar design, but they have a better turn of speed. With the increasing speed of helicopters, rotating-wing aircraft have taken over many army co-operation and artillery-spotting duties.

Although its speed is considerably lower than that of land-based jet-aircraft, the piston-engined flying-boat is unrivalled for long-distance sea patrols. It can carry the large quantity of fuel for great ranges, is exceptionally sturdy and enduring, and accommodates a heavy load of bombs and depth-charges.

Military transports are, in effect, the services' airliners. Their chief function is to carry troops and their equipment

safely and quickly over long distances. A typical military transport aircraft is the four-jet engine Comet.

At one time there was very little distinction between civil and military aircraft and their functions were often interchangeable. But in the years preceding the Second World War the design and structure of military and civil aircraft diverged more and more. The essential characteristics of a military aeroplane are now weight-carrying, speed, climb, manoeuvrability, good visibility and an effective load of offensive and defensive armament.

Even the fighter, which is not normally considered a weight-carrier, must accommodate in relation to its size and speed, a heavy load of guns and equipment. With bombers, bomb load is the measure of their efficiency as destructive weapons, and in order to outpace or outmanoeuvre fighters they must carry a heavy weight of motive power to give them the necessary speed.

One of the fundamentals in the design of military aircraft is that they must be capable of mass production in the shortest possible time. Consequently the design of major components must lend itself readily to large-scale tooling. Although such tooling involves heavy financial outlay, it is justified by the resultant economic and rapid production.

But the tooling must be such that it is easily adapted to modifications when improvements are made in the design of some particular aircraft. In this connexion it is interesting to note that military aircraft soon become obsolete, and from the designer's point of view are nearly out of date when they go into squadron service.

Manoeuvrability is almost as important as speed for military aircraft, particularly fighters. The basis of fighter tactics is to get into such a position relative to adversary that the maximum fire power can be brought to bear while preventing the opponent from doing likewise. This quality can be more important than the number of guns mounted, for it is little use having guns if they cannot be brought to bear on a target.

As to speed, a fighter must be as fast as possible without consideration of expense. Hence the greatest possible engine power must be packed into the smallest and lowest-drag fuselage. Rate of climb is vitally important, for a fighter cannot intercept unless it can climb rapidly. All these factors of manoeuvrability, speed, and rate of climb which were once considered peculiar to fighter aircraft have become increasingly important for bombers which, although they can now fly out of range of anti-aircraft artillery, must face fighters of ever-increasing speed.

Every part of a military aircraft must be as rugged as possible and able to function efficiently with minimum maintenance and in any part of the world and in all weather conditions. Accessibility of engines and other equipment must be simple, to make possible quick servicing at perhaps makeshift airfields.

Adequate supplies of spares are essential in the operation of military aircraft, for bomber and fighter parts, particularly, wear out much more quickly than do those of commercial aeroplanes. Moreover, the operational life of a military aircraft is much lower than that of a civil aeroplane. War time experience proved that the average flying life of a fighter is approximately 50 hours, equivalent to a total life of six months; whereas airline operators expect to get from their aircraft 200 hours a month for ten years before replacing them.

Military aviation is constantly in a state of change, and never more so than at the end of the first half-century of heavier-than-air craft. The development of the rocket and the guided missile and the atomic and hydrogen bombs posed fresh problems for designers, and attempts to counter these new weapons are sweeping aside all concepts of orthodox design.

BOOK LIST

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LATIN

It has often been remarked that to be fully educated, whether from the point of view of general culture, literature, or even science, a knowledge of Latin is important if not essential. That it need not be deep and wide is perhaps evidenced by the ground covered in the present Course, which provides a sound general foundation in grammar, syntax, and reading. From it will also be seen how much our English vocabulary owes to Latin, as also do the Romance languages of Europe.

The student and the general reader will be well advised to complete his studies by working through the Course on CLASSICAL LITERATURE, *in Vol. 1.*

12 LESSONS

LESSON 1

Pronunciation and Declensions of Nouns

The language which is to be studied in these Lessons is that written in Rome during, roughly, the first 50 years before and the 200 years after the commencement of the Christian era. This is known as the classical period of Latin, and it is the time during which many of Rome's most famous writers flourished. There also arose, side by side with this standard written form of the language, a variety of spoken Latin, which, through the extension of the Roman Empire, was carried by soldiers, officials, and traders into various parts of Europe, and even farther afield. This vulgar, low, or popular Latin, as it was variously called, gradually developed, in different areas, distinctive dialectal features, thus giving rise to a number of separate dialects, now known as the Romance languages. The chief of these are French, Italian, Spanish, Portuguese, and Rumanian.

The fact that the English language borrowed many words from French during the 12th, 13th, and 14th centuries, while French is derived directly from Latin, brings English closely into contact with Latin as regards a large section of its vocabulary. Moreover, many hundreds of words were adopted into English from Latin itself. For classical Latin, though gradually undergoing certain changes, especially in syntax, continued for many centuries to be the written language of scholarship all over Europe ; and when, during the 15th century and after, the languages of the individual nations began to replace Latin as the natural medium of scholarship, then philosophers, theologians, historians, and so on imported into their own tongue (and this is especially true of English) the technical terms which they had been in the habit of using in their Latin writings. A few examples, chosen at random, are : *benediction, nocturnal, configuration, insular*. From literature many of these words passed into the common colloquial speech.

Thus the English vocabulary owes a considerable debt to Latin, and a knowledge of even a few Latin words is very often a help in ascertaining the meaning of the terms of literature and learning. Furthermore, anyone who acquires enough grasp of Latin to enable him to read in the original the works of Virgil, Cicero, Horace, and other great masters of prose and verse will gain a privilege of incalculable worth.

Pronunciation

Latin is no longer a living, spoken language, and consequently there are various methods of pronouncing it. The pronunciation now usually adopted is as nearly as possible that of the classical period referred to above. A few sounds do not occur in modern English, but following are the nearest English equivalents.

Vowels may be either long or short. Those with the macron (-) above them are long ; those marked with the breve (˘), or unmarked, are short.

ā as in *father*	a as in *fat*	ae as in *my*
ē ,, *day*	e ,, *men*	au ,, *cow*
ī ,, *meet*	i ,, *bit*	oe ,, *toil*
ō ,, *note*	o ,, *not*	ui as u + i
ū ,, *boot*	u ,, *pull*	eu ,, e + u
		ei ,, e + i

Latin is far more regular than English in its use of consonant symbols, restricting for the most part one symbol to one sound.

Thus :

c is always pronounced as in *can*
g ,, ,, *go*
ng ,, ,, *finger* (not as in singer)
s ,, ,, *so* (not as in rose)
j is always pronounced as *y* in *yet*
v ,, ,, *w* in *win*

A syllable is said to be short if the vowel it contains is short and is followed by a single consonant ; the syllable is long if it contains a diphthong, or a long vowel, or a vowel followed by two consonants.

Latin words of two syllables are stressed on the first. Words of three or more syllables are stressed on the last syllable but one, if this is long (e.g. amāre to love), but, if it is short, on the preceding syllable (e.g. amāvimus we have loved ; facĭlĭtas ease).

Declensions of Nouns

There are five declensions of Latin nouns, known by the endings of their genitives :

Gen. Singular—ae, ī, is, us, ēi.
Gen. Plural ārum, ōrum, um *or* ium, uum, ērum

The first letter of the genitive plural ending indicates the declension, thus : 1st *-a*, 2nd *-o*, 4th *-u*, 5th *-e* ; the 3rd has consonant (*um*) or *-i* stems (p. 1093).

Nouns are declined by number and case, adjectives by number, case, and gender.

The numbers are two singular and plural

The genders are three : masculine, feminine, and neuter.

In Latin the gender of a noun is often determined by its ending, not, as in English, by its meaning. Thus : *mensa*=a table, is feminine, though " table " is neuter in English.

The cases are six :

	Answers the question
1. Nominative.	Who or what ?
2. Vocative.	(Case of the person addressed.)
3. Accusative	Whom or what ?
4. Genitive.	Of whom or what ?
5. Dative	To or for whom or what ?
6. Ablative	By, with, or from whom or what ?

NOTE: The dative and ablative plural are always the same.

Nouns of the First Declension have *-a* stems. The nominative case ends in *-a*, except a few in *-as* and *-es*. Nearly all nouns ending in *-a* are of feminine gender. There are no neuters in this declension.

	Singular	*Plural*
Nom. (or subject)	*mensa*, a table	*mensae*, tables
Voc.	*mensa*, O table	*mensae*, O tables
Accus. (or object)	*mensam*, a table	*mensās*, tables
Gen.	*mensae*, of a table	*mensārum*, of tables
Dat.	*mensae*, to or for a table	*mensīs*, to or for tables
Abl	*mensā*, by, with, or from a table	*mensīs*, by, with, or from tables

Like *mensa* decline almost all nouns ending in *-a*, except that *dea* (goddess) and *fīlia* (daughter) make dative and ablative plural *deābus* and *fīliābus* (to distinguish them from the dative and ablative plural of *deus* = god, and *fīlius* = son).

Nouns of the Second Declension have stems in *o* and are almost invariably masculine or neuter, the former ending in *us* or *er* and the latter in *um*. They are declined as follows:

	Singular	*Plural*	*Singular*	*Plural*
	mind		boy	
Nom	*animus*	*animī*	*puer*	*puerī*
Voc.	*anime*	*animī*	*puer*	*puerī*
Acc.	*animum*	*animōs*	*puerum*	*puerōs*
Gen	*animī*	*animōrum*	*puerī*	*puerōrum*
Dat.	*animō*	*animīs*	*puerō*	*puerīs*
Abl.	*animō*	*animīs*	*puerō*	*puerīs*
	workman		gift	
Nom.	*faber*	*fabrī*	*dōnum*	*dōna*
Voc.	*faber*	*fabrī*	*dōnum*	*dōna*
Acc.	*fabrum*	*fabrōs*	*dōnum*	*dōna*
Gen	*fabrī*	*fabrōrum*	*dōnī*	*dōnōrum*
Dat.	*fabrō*	*fabrīs*	*dōnō*	*dōnīs*
Abl	*fabrō*	*fabrīs*	*dōnō*	*dōnīs*

NOTE: The vocative of *deus* (god) is *deus*; nominative, plural, *dī*; dative and ablative plural, *dīs*. The vocative of *fīlius* (son) is *fīlī*. *Vir* (a man) is declined like *puer*; accusative, *virum*, genitive, *virī*; dative and ablative, *virō*.

All neuter nouns, of any declension, take *-a* in nominative, vocative, and accusative plural.

Nouns of the Third Declension are grouped in two divisions: (*a*) consonant stems; (*b*) *-i* stems.

Roughly speaking, the nouns in the first division have more syllables in their genitive singular than in the nominative singular (imparisyllabic), while those in the second have the same number of syllables in the genitive singular as in the nominative singular (parisyllabic).

Consonant Stems : Masculine and Feminine

Singular

	judge	man	age	lion	foot	
	M.	M.	F.	M	M	
N., V.	*jūdex*	*homo*	*aetās*	*leō*	*pēs*	—
Acc.	*jūdic-*	*homin-*	*aetāt-*	*leōn-*	*ped-*	EM
Gen.	*jūdic-*	*homin-*	*aetāt-*	*leōn-*	*ped-*	IS
Dat.	*jūdic-*	*homin-*	*aetāt-*	*leōn-*	*ped-*	Ī
Abl.	*jūdic-*	*homin-*	*aetāt-*	*leōn-*	*ped-*	E

Plural

N., V., A.	*jūdic-*	*homin-*	*aetāt-*	*leōn-*	*ped-*	ĒS
Gen.	*jūdic-*	*homin-*	*aetāt-*	*leōn-*	*ped-*	UM
D., Abl	*jūdic-*	*homin-*	*aetāt-*	*leōn-*	*ped-*	IBUS

Singular

	father	law	honour	cinder	swine	
	M.	F.	M	M	M or F	
N., V.	*pater*	*lex*	*honos*	*cinis*	*sus*	
Acc.	*patr-*	*leg-*	*honōr-*	*ciner-*	*su-*	EM
Gen.	*patr-*	*leg-*	*honōr-*	*ciner-*	*su-*	IS
Dat.	*patr-*	*leg-*	*honōr-*	*ciner-*	*su-*	Ī
Abl	*patr-*	*leg-*	*honōr-*	*ciner-*	*su-*	E

Plural

N., V., A.	*patr-*	*leg-*	*honōr-*	*ciner-*	*su-*	ĒS
Gen.	*patr-*	*leg-*	*honōr-*	*ciner-*	*su-*	UM
D., Abl	*patr-*	*leg-*	*honōr-*	*ciner-*	*su-*	IBUS

Consonant Stems : Neuter

Singular

	grass	work	time	hardwood	
N., V., A	*grāmen*	*opus*	*tempus*	*rōbur*	
Gen.	*grāmin-*	*oper-*	*tempor-*	*rōbor-*	IS
Dat.	*grāmin-*	*oper-*	*tempor-*	*rōbor-*	Ī
Abl	*grāmin-*	*oper-*	*tempor-*	*rōbor-*	E

Plural

N., V., A.	*grāmin-*	*oper-*	*tempor-*	*rōbor-*	A
Gen.	*grāmin-*	*oper-*	*tempor-*	*rōbor-*	UM
D., Abl	*grāmin-*	*oper-*	*tempor-*	*rōbor-*	IBUS

Similarly with other neuter nouns: *caput*, *capitis* (head); *crūs*, *crūris* (leg); *fulgur*, *fulguris* (lightning); *cadāver*, *cadāveris* (corpse), etc.

-i Stems

Singular

	raft	temple, room	art	tooth	shower
	F.	F.	F.	M.	M.
N., V.	*ratis*	*aedēs*	*ars*	*dens*	*imber*
Acc.	*ratem*	*aedem*	*artem*	*dentem*	*imbrem*
Gen.	*ratis*	*aedis*	*artis*	*dentis*	*imbris*
Dat.	*ratī*	*aedī*	*artī*	*dentī*	*imbrī*
Abl.	*rate*	*aede*	*arte*	*dente*	*imbre*

Plural

N., V., A	*ratēs*	*aedēs*	*artēs*	*dentēs*	*imbrēs*
Gen.	*ratium*	*aedium*	*artium*	*dentium*	*imbrium*
D., Abl	*ratibus*	*aedibus*	*artibus*	*dentibus*	*imbribus*

(Note the *i* in the genitive plural.)

NOTE: *Aedēs* (plural) also means a house (i.e. a set of rooms.)

Singular

	fire	animal	bone	sea
	M.	N.	N.	N
N., V.	*ignis*	*animal*	*os*	*mare*
Acc	*ignem*	*animal*	*os*	*mare*
Gen	*ignis*	*animālis*	*ossis*	*maris*
Dat.	*ignī*	*animālī*	*ossī*	*marī*
Abl.	*igne* or *ī*	*animālī*	*osse*	*marī*

Plural

N., V., A.	*ignēs*	*animālia*	*ossa*	*maria*
Gen.	*ignium*	*animālium*	*ossium*	*marium*
D., Abl.	*ignibus*	*animālibus*	*ossibus*	*maribus*

NOTE: *-i* nouns in *-ans* and *-ens* often drop *i* in genitive plural, e.g. *parens*, *parentum*.

Nouns of the Fourth Declension have *-u* stems. The nominative ends in *-us* (mostly masculine) and in *-u* (always neuter).

-u **Stems**

	Singular	*Plural*
N., V.	*gradus* (step)	*gradūs*
Acc.	*gradum*	
Gen.	*gradūs*	*graduum*
Dat	*gradui*	*gradibus* (or *gradubus*)
Abl.	*gradū*	
N., V., A.	*genū* (knee)	*genua*
Gen.	*genūs*	*genuum*
Dat.	*genū*	*genibus* (or *genu*
Abl.		

A few nouns of this declension ending in *-us* are feminine: e.g. *manus* (hand), *acus* (needle), *domus* (house), *tribus* (tribe), *porticus* (porch), *anus* (old woman). *Domus* makes dat. sing. *domuī* or *domō*, abl. *domō*, acc. pl. *domūs* or *domōs*, gen. *domuum* or *domōrum* (partly second and partly fourth declension).

Nouns of the Fifth Declension have *-e* stems. They have the nominative in *-es*, and are feminine (except *diēs*, which is common gender in singular, and masculine in plural).

-e **Stems**

	Singular	*Plural*
N., V	*diēs* (day)	*diēs*
Acc.	*diem*	*diēs*
Gen	*diēī*	*diērum*
Dat.	*diēī*	*diēbus*
Abl.	*diē*	*diēbus*

For some peculiarities of nouns *see* Lesson 11, page 1115.

LESSON 2

Adjectives and Adverbs

An adjective in Latin agrees with the noun it qualifies in gender, number and case. When an adjective qualifies nouns of different genders, it agrees with the masculine rather than with the feminine—e.g. *Frater mihi* (or *meus*) *et soror mortui sunt* = my brother and sister are dead. If the nouns are lifeless things, no matter what their gender, the adjective is neuter—e.g. *Divitiae et gloria jucunda* (neut. pl.) *sunt* = riches and glory are pleasant.

Adjectives having three endings in *us, a, um* (masculine, feminine, neuter) or *er, a, um*, follow the Second and First Declensions of nouns. The masculine is declined like *animus*, *puer*, or *faber*; the feminine like *mensa*; the neuter like *dōnum*. Thus we decline the adjective *bonus* (good) as shown below.

	M.	F.	N.
Nom.	*bonus*	*bona*	*bonum*
Voc.	*bone*	*bona*	*bonum*
Acc.	*bonum*	*bonam*	*bonum* etc.
Also			
Nom.	*tener* (tender)	*tenera*	*tenerum*
Voc.	*tener*	*tenera*	*tenerum*
Acc.	*tenerum*	*teneram*	*tenerum*, etc.
Nom	*niger* (black)	*nigra*	*nigrum*
Voc.	*niger*	*nigra*	*nigrum*
Acc.	*nigrum*	*nigram*	*nigrum*, etc.

All the other adjectives follow the Third Declension. Thus, *melior* (better), *similis* (like), *ingens* (vast), *audax* (bold).

Singular

	M., F.	N.	M., F.	N.
N., V.	*melior*	*melius*	*similis*	*simile*
Acc.	*meliōrem*	*melius*	*similem*	*simile*
Gen.	*meliōris*		*similis*	
Dat.	*meliōrī*		*similī*	
Abl.	*meliōre* or *ī*		*similī*	

Plural

	M., F.	N.	M., F.	N.
N., V., A.	*meliōrēs*	*meliōra*	*similēs*	*similia*
Gen.	*meliōrum*		*similium*	
D., Abl.	*meliōribus*		*similibus*	

NOTE: All adjectives ending in *-is* make their ablative singular in *-ī*.

Singular

	M., F.	N.	M., F.	N
N., V.	*ingens*	*ingens*	*audax*	*audax*
Acc.	*ingentem*	*ingens*	*audācem*	*audax*
Gen.	*ingentis*		*audācis*	
Dat.	*ingentī*		*audācī*	
Abl.	*ingente* or *ī*		*audācī* (rarely *e*)	

Plural

	M., F.	N.	M., F.	N.
N., V., A.	*ingentes*	*ingentia*	*audācēs*	*audācia*
Gen	*ingentium*		*audācium*	
D., Abl.	*ingentibus*		*audācibus*	

NOTE: All present participles are declined like *ingens*.

Adjectives in *-er* of the Third Declension have three endings in nominative singular: e.g. *celer, celeris, celere* (swift); *ācer, ācris, ācre* (keen). No other adjective is declined like *celer*.

Singular

	M	F.	N.	M	F.	N.
N., V.	*celer*	*celeris*	*celere*	*ācer*	*ācris*	*ācre*
Acc.	*celerem*		*celere*	*ācrem*		*ācre*
Gen.	*celeris*			*ācris*		
D., Abl.	*celerī*			*ācrī*		

Plural

	M., F.	N.	M., F.	N.
N., V., A.	*celerēs*	*celeria*	*ācrēs*	*ācria*
Gen.	*celerium*		*ācrium*	
D., Abl.	*celeribus*		*ācribus*	

Comparison of Adjectives

Adjectives have three degrees of comparison: the positive, the comparative, and the superlative, e.g. *longus*, long; *longior*, longer *or* too long; *longissimus*, longest *or* very long. The comparative and superlative are formed by changing the *-i* or *-is* of the genitive of the positive into *-ior* and *-issimus* respectively. Thus:

dūrus (hard)	gen. *dūrī*	*dūrior*	*dūrissimus*
tristis (sad)	gen. *tristis*	*tristior*	*tristissimus*
audax	gen. *audācis*	*audācior*	*audācissimus*

EXCEPTIONS

1. Adjectives in *-er* form the superlative by adding *-rimus* to the nominative (i.e. they double the *r* and add *-imus*), e.g.:

asper (rough)	*asperior*	*asperrimus*

(So *celer, miser, līber, pauper, tener*, etc.)

pulcher (beautiful)	*pulchrior*	*pulcherrimus*

(So *niger*, *piger*, *ācer*, *ruber*, *vafer*, etc.)

vetus (ancient) has comparative *vetustior*, superlative *veterrimus*.

2. Six adjectives in *-ilis* double the *l* for the superlative and add *-imus* :

similis	*similior*	*simillimus*

So *dissimilis* (unlike), *facilis* (easy), *difficilis* (difficult), *gracilis* (slender), *humilis* (lowly)

All the others in *-ilis* are regular, thus:

ūtilis (useful)	*ūtilior*	*utilissimus*

3. The following are irregular :

bonus (good)	*melior*	*optimus*
malus (bad)	*pējor*	*pessimus*
magnus (great)	*mājor*	*maximus*
parvus (small)	*minor*	*minimus*
multus (much)	**plūs* (neuter)	*plurimus*
nēquam (wicked)	*nēquior*	*nēquissimus*
dives (rich)	{ *divitior* / *dītior*	{ *divitissimus* / *dītissimus*
senex (old)		*nātū maximus* (by birth the greatest)
juvenis (young)	*jūnior*	*nātū minimus*
potis (able)	*potior* (better)	*potissimus* (principal, most important)
(no positive)	*ōcior* (swifter)	*ōcissimus*
†*frūgi* (frugal)	*frūgālior*	*frugālissimus*
egenus (needy)	*egentior*	*egentissimus*

*There is no masculine or fe[illegible]e singular of *plus*, but full plural Nom and Acc *plūrēs*, *plūra* Gen *plūrium*. Dat. and Abl *plūribus*

† Dative of *frugem* (acc) *frugis*, fruit

4. Adjectives in *-dicus*, *-ficus*, and *-volus* change *us* into *-entior*, *-entissimus*.

maledicus	*maledīcentior*	*maledīcentissimus*
beneficus	*beneficentior*	*beneficentissimus*
malevolus	*malevolentior*	*malevolentissimus*

5. Adjectives ending in *-us*, preceded by a vowel, have no comparative or superlative ; to form one, use *magis* and *maximē* (adverbs) = more and most. Thus :

idōneus (useful)	*magis idōneus* (more useful)	*maximē idōneus* (most useful)

But *antiquus*, *pinguis*, *and tenuis* are regular, because the *u* is really consonantal

6. The following comparative and superlative adjectives spring from prepositions :

citrā (on this side)	*citerior*	*citimus*
dē (down from)	*dēterior* (worse)	*dēterrimus*
extrā (outside)	*exterior*	*extrēmus*, *extimus*
infrā (below)	*inferior*	*infimus*, *īmus*
intrā (within)	*interior*	*intimus*
post (after)	*posterior* (later)	*postrēmus* (last), *postumus* (late-born, posthumous)
prae (before)	*prior*	*primus* (first)
prope (near)	*propior*	*proximus*
super (above)	*superior*	*suprēmus* (last or highest), *summus*
ultrā (beyond)	*ulterior*	*ultimus* (last)

Adverbs and their Comparison

Adverbs derived from adjectives with *-i* stems usually end in *-ter* ; from other adjectives, usually in *-e*. Thus : *audax*, *audāc(i)ter*; *brevis* (short), *breviter* (shortly) ; *dignus* (worthy), *digne* (worthily). In comparison they imitate their corresponding adjective, but in the comparative end in *-us*, and in the superlative in *-ē* :

graviter (weightily)	*gravius*	*gravissimē*
digne	*dignius*	*dignissimē*
audacter	*audācius*	*audācissimē*
	Irregular	
multum (much)	*plūs*	*plūrimum*
magnopere (greatly)	*magis* (more)	*maximē*

Diū (for a long time) has comparative *diūtius*, superlative *diūtissimē*.

LESSON 3

Prepositions and the Verb "To Be"

In Latin, as in English, prepositions are, as their name implies, almost always placed before their nouns. They are indeclinable They are used with either the accusative or the ablative case, with the exception of *tenus*, which is used generally with the ablative, but can take the genitive.

The following take the accusative :

ante before	*apud*, among, near
ad, to, at	*adversus*, opposite to
circum or *circā*, round, on both sides of	
citrā or *cis*, this side of	
ergā, towards	*contrā*, against
inter, among, between	*extrā*, outside of
infrā, below	*intrā*, within
juxtā, close to	*ob*, on account of
penes, in the power of	*pōne*, behind
post, behind, after	*praeter*, beyond, except
prope, near to	
propter, on account of, thanks to	*per*, through
secundum, along, after, according to	*suprā*, above, beyond
versus, in the direction of	
ultrā, beyond	*trans*, across

The following take the ablative :

ā (*ab*) by, with, from	*palam* before, in the presence of	*cum* with
	and *dē* down from ; concerning	
cōram in the presence of		*prō* in front of, on behalf of
	with *ex* or *ē*, out of, from	
tenus, as far as	*sine*, without	also *prae*, in front of

The following take the accusative when they denote "motion towards," but the ablative when they denote "place at" :

Sub and *Subter* = (1) with accusative, "up to"; *sub mūros* = up to the walls.
(2) with ablative "beneath."

Super = (1) with accusative, "above," "beyond"; as, *super Indōs* = beyond the Indians.
(2) with ablative "on."

In = (1) with accusative, "into, to, against."
(2) with ablative, "in, at, on"

Unlike most prepositions, *tenus* and *versus* are placed after their nouns: e.g. *Rōmam versus*, in the direction of Rome. Write, as one word, *mēcum, tēcum, sēcum, nōbiscum, quibuscum*, etc. (with me, with thee, etc.), not *cum mē*, etc. (*See* Pronouns, next Lesson.)

VERB To Be

Indicative Mood

	Singular	*Plural*
PRESENT TENSE		
1st person	*sum*, I am	*sumus*, we are
2nd person	*es*, thou art	*estis*, ye are
3rd person	*est*, he, she, or it is	*sunt*, they are
FUTURE		
1st person	*erō*, I shall be	*erimus*
2nd person	*eris*	*eritis*
3rd person	*erit*	*erunt*
IMPERFECT		
1st person	*eram*, I was	*erāmus*
2nd person	*erās*	*erātis*
3rd person	*erat*	*erant*
PERFECT		
1st person	*fuī*, I have been	*fuimus*
2nd person	*fuistī*	*fuistis*
3rd person	*fuit*	*fuērunt, fuēre*
FUTURE PERFECT		
1st person	*fuerō*, I shall have been	*fuerimus*
2nd person	*fueris*	*fueritis*
3rd person	*fuerit*	*fuerint*
PLUPERFECT		
1st person	*fueram*, I had been	*fuerāmus*
2nd person	*fuerās*	*fuerātis*
3rd person	*fuerat*	*fuerant*

Subjunctive Mood

	Singular	*Plural*
PRESENT		
1st person	*sim*, I may be, or let me be	*sīmus*
2nd person	*sīs* thou mayest be	*sītis*
3rd person	*sit*, he may be, or let him be	*sint*
IMPERFECT		
1st person	*essem*, I might be	*essēmus*
2nd person	*essēs*	*essētis*
3rd person	*esset*	*essent*
PERFECT		
1st person	*fuerim*, I may have been	*fuerīmus*
2nd person	*fueris*	*fuerītis*
3rd person	*fuerit*	*fuerint*
PLUPERFECT		
1st person	*fuissem*, I should or might have been	*fuissēmus*
2nd person	*fuissēs*	*fuissētis*
3rd person	*fuisset*	*fuissent*

Imperative Mood

PRESENT	*es* be thou	*este*, be ye
FUTURE	*estō*, thou must be	*estōte*, ye must be
	estō, he must be	*suntō*, they must be

Infinitive Mood

Present: *esse*, to be
Perfect and Pluperfect *fuisse*, to have been
Future Participle: *futūrus*, about to be
Future Infinitive: *futūrus esse*, to be about to be

NOTE: To form the imperfect subjunctive of a verb, add *-m* to present infinitive *esse, essem*. Likewise add *-m* to perfect infinitive to form pluperfect subjunctive: *fuisse, fuissem*.

Syntax

1. A finite verb agrees with its subject (or its nominative case) in number and person. [This does not apply to the infinitive mood.] For example, *Servus adest*, the slave is present. *Adsum* (*ego*), I am present. *Magistrī aderunt*, the masters will be present. [*Adsum* is a compound of the preposition *ad* and *sum*.]

2. A substantive may have another substantive added to explain or describe it; the latter is then said to be in *apposition* to the former, and must agree with it in case e.g. *Fīlius Victōriae, rēginae Britannōrum, rex erat* the son of Victoria, queen of the Britons, was king. (*Rēginae* is genitive, in apposition to *Victōriae*.)

NOTE Any finite part of the verb *sum* is usuall copula or link, linking the complement to the subjec thus *Georgius erat rex* George was king The co plement will, of course, agree with the subject *number* and *case*, and (if the complement be an adjective) in *gender* as well e.g. *Bellum erit longum* the war be long

The student can now attempt the translation of some Latin sentences into English. Before doing this, however, he or she is advised to learn the words in the vocabulary below.

Vocabulary

probus, -a -um	good, honest
beātus, -a, -um	happy
ut	in order that (takes the subjunctive)
oppidum, -ī	town
Londinium, -ī	London
lātus, -a, -um	broad
fluvius, -ī	river
poēta, -ae (masc.)	poet
Rōmānī, -ōrum	Romans
humerus, -ī	shoulder
vērus, -a, -um	true
amīcitia, -ae	friendship
castrum, -ī	fort (in pl. *castra* - a camp)
sī	if (with subjunctive)
albus, -a, -um	white
nōn	not
lūdus, -ī	school (also—play, game)
parvus, -a, -um	small
discipulus, -ī	scholar, pupil
laetus, -a, -um	joyful
dominus, -ī	master
pallium, -ī	cloak

NOTE: Length marks are not added in these and other sentences and passages in Latin. The student should, however, mark the long vowels in translating English into Latin.

EXERCISE I

1. Este probi ut beati sitis.
2. Oppidum Londinium est prope latum fluvium.
3. Servus sit penes dominum.
4. Vergilius erat poeta apud Romanos.
5. Pallium fuerat in humeris reginae.
6. Vera amicitia est donum deorum.
7. Castrum Romanorum erat trans fluvium.
8. Si albi fuissent, non nigri fuissent.
9. In ludo erant parvi discipuli.
10. Laeti sunt animi bonorum.

NOTE. *Man* and *men* are often not expressed in Latin e.g. *boni* the good

The beginner is recommended, after writing out the above exercise, to reverse the process and turn the sentences into Latin again. He should then translate into Latin the sentences that follow:

Vocabulary

ally	*socius, -ī*
Gauls	*Gallī, ōrum*
path	*via, -ae*
wood	*silva, -ae*
and	*et*
miserable	*miser, misera, miserum*
island	*insula, -ae*
wave	*unda, -ae*
friend	*amicus, -ī*
pear-tree	*pirus -ī*
weak	*invalidus, -a, -um*
straight	*rectus, -a, -um*
Britain	*Britannia, -ae*
book	*liber, librī*
garden	*hortus, -ī*
crown	*corōna, -ae*
gate	*porta, -ae*
strong	*validus, -a, -um*

EXERCISE II

1. The war between the Romans and the allies of the Gauls will be a long one (omit " one ").
2. The path to (use preposition *ad*) the wood is broad and straight.
3. If she had been good (" she " need not be expressed, it will be conveyed by the gender of the adjective " good "), she would not have been miserable.
4. The island of Britain (say, " the island Britain," Britain being in apposition to island) is in the midst of (say " among ") the waves.
5. The boy's book (the book of the boy) was the gift of (his) friend.
6. In the garden there had been a pear-tree.
7. I give (*do*) a crown to the good slave.
8. I walk (*ambulo*) to the gates of the town.
9. Let us be friends and allies to the weak slaves.
10. " To be " is good (neut.). " to have been " is better.

NOTE: Throughout this Course keys to exercises and translations are given in the Lesson following them.

LESSON 4

Pronouns and Pronominal Adjectives

IN this Lesson are considered not only the pronouns proper, but also various pronominal adjectival forms.

Personal Pronouns

FIRST PERSON

	Singular	*Plural*
Nom.	*ego*, I	*nōs*, we
Acc.	*mē*, me	*nōs*, us
Gen	*meī*, of me	**nostrī* or *nostrum*, of us
Dat	*mihi*, to or for me	*nōbīs*, to or for us
Abl	*mē*, by me, etc	*nōbīs*, by us, etc.

SECOND PERSON:

	Singular	*Plural*
Nom.	*tu*, thou	*vōs*, ye
Acc	*tē*, thee	*vōs*, you
Gen.	*tuī*	**vestrī* or *vestrum*
Dat.	*tibī*	*vōbīs*
Abl.	*tē*	*vōbīs*

* NOTE *Nostrum* and *vestrum* are partitive genitives - that is, used in phrases like " many of us " (*multi nostrum*), " two of you " (*duo vestrum*), where the genitive stands to the nominative in the relation not of a possessor, but of a whole to a part. But " love of us " would be *amor nostri*. *See* Lesson 6.

THIRD PERSON:

For he, she, it, the demonstrative pronouns *hic*, *is*, and *ille* (*see* below) are used Thus, masculine *hic* (he), feminine *haec* (she), neuter *hoc* (it).

Demonstrative Pronouns. Used either as adjectives or substantivally: thus (1) *hic puer* =

1. SIMPLE OR UNEMPHATIC

Singular

	Masc.	Fem	Neut.
Nom.	*is* (that, or he)	*ea* (she)	*id* (it)
Acc.	*eum*	*eam*	*id*
Gen	*ejus*	*ējus*	*ejus*
Dat.	*eī*	*eī*	*eī*
Abl.	*eō*	*eā*	*eō*

Plural

	Masc.	Fem	Neut.
Nom	*iī*	*eae*	*ea*
Acc.	*eōs*	*eās*	*ea*
Gen	*eōrum*	*eārum*	*eōrum*
Dat	*iīs* or *eīs* (all genders)		
Abl.	*iīs* or *eīs*		

2. EMPHATIC

Hic, this (near me): the demonstrative pronoun of the first person.

Singular

	Masc.	Fem.	Neut.
Nom	*hic*	*haec*	*hoc*
Acc.	*hunc*	*hanc*	*hoc*
Gen.	*hūjus*		
Dat.	*huic*		
Abl.	*hōc*	*hāc*	*hōc*

Plural

	Masc.	Fem.	Neut.
Nom.	*hī*	*hae*	*haec*
Acc.	*hōs*	*hās*	*haec*
Gen.	*hōrum*	*hārum*	*hōrum*
Dat. and Abl.	*hīs*		

Iste, that (near you): the demonstrative pronoun of the second person. (Often used contemptuously—e.g. *istī* = those contemptible friends of yours. In law, *hic* = my client, *iste* = my opponent, the defendant.)

	Singular		
	Masc.	Fem.	Neut.
Nom.	*iste*	*ista*	*istud*
Acc.	*istum*	*istam*	*istud*
Gen.		*istīus*	
Dat.		*istī*	
Abl.	*istō*	*istā*	*istō*
	Plural		
Nom.	*istī*	*istae*	*ista*
Acc.	*istōs*	*istās*	*ista*
Gen.	*istōrum*	*istārum*	*istōrum*
Dat.		*istīs*	
Abl.		*istīs*	

Ille, that (near him) : the demonstrative pronoun of the third person = that yonder. (Often means "the distinguished" : *Cato ille* = the great Cato.) *Ille* is declined like *iste*.

Definitive Pronouns. *Idem*, the same, and *ipse*, self, are declined as follows :

	Singular		
	Masc.	Fem.	Neut.
Nom.	*īdem*	*eadem*	*īdem*
Acc.	*eundem*	*eandem*	*īdem*
Gen.		*ējusdem*	
Dat.		*eīdem*	
Abl.	*eōdem*	*eādem*	*eōdem*
	Plural		
Nom.	*eīdem*	*eaedem*	*eadem*
Acc.	*eōsdem*	*eāsdem*	*eadem*
Gen.	*eōrundem*	*eārundem*	*eōrundem*
Dat.		*eīsdem*	
Abl.		*eīsdem*	

Ipse, self, is declined like *ille*, except that the neuter sing. nom. and acc. is not *ipsud*, but *ipsum*. Examples of its use : *ego ipse* = I myself ; *illō ipsō die* = on that very day

The Reflexive Pronoun *sē* is declined thus :

Singular and Plural

Nom.	(wanting . use *ipse* for he, himself).
Acc.	*sē* (or *sēsē*), himself, herself, itself, themselves
Gen.	*sui*, of himself, etc.
Dat.	*sibī*, to or for himself, etc.
Abl.	*sē* or *sēsē*, by himself, etc.

Possessive Pronouns. Of these *meus*, *tuus*, *suus* are declined like *bonus*. *Noster* and *vester* are declined like *niger*. *Meus* has vocative masculine *mī*, *tuus* and *suus* have none.

	Singular		
	Masc.	Fem.	Neut.
1st person	*meus*	*mea*	*meum* (my, mine)
2nd person	*tuus*	*tua*	*tuum* (thy, thine)
3rd person	*suus*	*sua*	*suum* (his own, etc.)
	Plural		
1st person	*noster*	*nostra*	*nostrum* (our)
2nd person	*vester*	*vestra*	*vestrum* (your)
3rd person	*suus*	*sua*	*suum* (their own)

NOTE : *Sē* and *suus* can be used only when the person they denote is the same as the subject of the principal verb : e.g. Brutus killed *himself* (*sē*) with *his own* (*suō*) dagger. For the ordinary third person possessive use genitive of *is*, *hic*, or *ille* : thus, *sumus ejus servi* = we are his slaves.

Relative Pronoun

Quī, who or which, agrees with its antecedent (i.e. the word to which it *relates*) in number and gender, but it takes its case from its own clause : e.g. *Cārus est amīcus quem crās vidēbō*, dear is the friend whom I shall see to-morrow.

	Singular			Plural		
	M.	F.	N.	M.	F.	N.
N.	*quī*	*quae*	*quod*	*quī*	*quae*	*quae*
A.	*quem*	*quam*	*quod*	*quōs*	*quās*	*quae*
G.		*cūjus*		*quōrum*	*quārum*	*quōrum*
D.		*cui*			*quibus* or *quīs*	
A.	*quō*	*quā*	*quō*		*quibus* or *quīs*	

Interrogative Pronoun

Quis, who or what ? is declined like *quī*, except for the nom. and acc. singular :

	M.	F.	N.
Nom.	*quis*	(*quis*)	*quid*
	quī	*quae*	*quod*
Acc.	*quem*	*quam*	*quid*
	quem	*quam*	*quod*

NOTE : The forms *quis*, *quid* are substantival, e.g. *quis adest ?* who is present ? But *quī*, *quod* are adjectival, i.e. used with nouns, e.g. *quī mīles ?* what soldier ?

The **Indefinite Pronoun** *quis* (anyone) is declined like the interrogative, except that the nominative singular is *quis*, *qua*, *quid*.

The compounds of *quī* and *quis* are :

1. *Quisnam*, *quidnam* ? (also *quīnam*) who ?
2. *Ecquis*, *ecqua*, *ecquid* ? anyone ? (rare)
3. *Aliquis*, *aliqua*, *aliquid*, someone.
4. *Quispiam*, *quaepiam*, *quodpiam*, some.
5. *Quisquam*, *quicquam*, any at all (generally used with negatives, e.g. *nec quisquam*, nor anyone, i.e. and no one)
6. *Quīdam*, *quaedam*, *quoddam*, certain, a certain person (very definite)
7. *Quīcumque*, *quaecumque*, etc., whosoever.
8. *Quisquis*, whoever , *quidquid*, whatever
9. *Quīvīs*, *quaevīs*, *quodvīs*, which you will (very indefinite : *vīs* means "thou wishest").
10. *Quīlibet*, which you like (*libet* is an impersonal verb, it pleases).
11. *Quisque*, *quaeque*, *quicque*, each (also *ūnusquisque* each one).

The following **Numeral Adjectives** and **Pronoun-Adjectives** have the ending *-īus* for all genders of the genitive singular and *-ī* for all genders of the dative singular :

ūnus (one), *ullus* (any at all), *nullus* (none), *sōlus* (alone).

tōtus (whole), *alter* (the other), *uter* (which of two), and its compounds *uterque*, etc., *neuter* (neither), *alius* (other, another), *ille*, *iste*, and *ipse*.

Except for the genitive and dative singular, the first five are declined like *bonus*, *alter* like *tener*, and *uter* and *neuter* like *niger*.

Alius is declined as follows :

	Singular		
	Masc.	Fem.	Neut.
Nom.	*alius*	*alia*	*aliud*
Acc.	*alium*	*aliam*	*aliud*
Gen.		*alīus*	
Dat.		*alī*	
Abl.	*aliō*	*aliā*	*aliō*

Plural

	Masc.	Fem.	Neut.
Nom.	*aliī*	*aliae*	*alia*
Acc.	*aliōs*	*aliās*	*alia*
Gen.	*aliōrum*	*aliārum*	*aliōrum*
D. and Abl		*aliīs*	

Singular

	Masc.	Fem.	Neut.
Nom.	*ūnus*	*ūna*	*ūnum*
Acc.	*ūnum*	*unam*	*ūnum*
Gen		*ūnīus*	
Dat.		*ūnī*	
Abl.	*ūno*	*ūnā*	*unō*

Plural

	Masc	Fem.	Neut
Nom	*ūnī*	*ūnae*	*ūna*
Acc.	*ūnōs*	*ūnās*	*ūna*
Gen.	*ūnōrum*	*ūnārum*	*unorum*
D. and Abl.		*ūnīs*	

NOTE : *Unus* in the plural is used with nouns whose plural denotes a singular, as *ūna castra* = one camp (*castrum* = a fort ; *castra*, plural = a camp).

Before leaving the pronoun-adjectives, the following correlatives may be noticed :

Interrogative. *Quālis* (of what kind ?) ; *quantus* (how great ?) , *quot* (how many ?).

Demonstrative. *Tā'is* (such) ; *tantus* (so great) ; *tot* (so many).

Relative. *Quālis* (as) ; *quantus* (as) ; *quot* (as).

Indefinite. *Aliquantus* (of some size) ; *aliquot* (some few).

Universal. *Quāliscumque* (of what kind soever) ; *quantuscumque* (how great soever) ; *quotcumque* (how many soever).

Keys to Exercises in Lesson 3

(I) 1. Be honest in order that you may be happy. 2. The town of London (note omission of "of") is near a broad river. 3. Let the slave be in the power of his master 4. Virgil was a poet among the Romans. 5. The cloak had been on the queen's shoulders. 6. True friendship is the gift of the gods. 7. The fort of the Romans was across the river. 8. If they had been white (men) they would not have been black. 9. In the school there were small scholars. 10. Joyful are the minds of the good (men).

(II) 1. Bellum inter Romanos et socios Gallorum erit longum. 2. Via ad silvam est lata et recta. 3. Si bona fuisset, non misera fuisset. 4. Insula Britannia est inter undas. 5. Pueri liber erat amici donum. 6. In horto fuerat pirus. 7. Do coronam *bono servo* (indirect object). 8. Ambulo ad portas oppidi. (NOTE : The dative, *portis*, would be wrong here ; "to the gates" is not indirect object. Wherever "to" expresses "motion to" use *in* or *ad* with accusative.) 9. Simus amici et socii invalidis servis. 10. Esse est bonum ; melius (est) fuisse.

LESSON 5

Verbs and Their Four Regular Conjugations

LATIN verbs have two voices, active and passive ; two numbers, singular and plural ; and three persons in each number : thus 1st pers. *amō*, I love ; 2nd, *amās*, thou lovest ; 3rd, *amat*, he loves. The pronouns are not expressed.

There are **four regular conjugations :**

		Pres. Indic.	*Infinitive*	
1st	*A*-verbs	*amō*	*amĀ-re*	I love
2nd	*E*-verbs	*moneō*	*monĒ-re*	I warn
3rd	Consonant	*regō*	*reG-ere*	I rule
or	*U*-verbs	*induō*	*indU-ere*	I put on
4th	*I*-verbs	*audio*	*audĪ-re*	I hear

Indicative Mood (Active)

Singular 1st person	2nd	3rd	*Plural* 1st	2nd	3rd

PRESENT

Am-ō	*ās*	*at*	*āmus*	*ātis*	*ant*
(I love, or am loving, etc.)					
Mon-eō	*ēs*	*et*	*ēmus*	*ētis*	*ent*
(I warn, or am warning, etc.)					
Reg-ō	*is*	*it*	*imus*	*itis*	*unt*
(I rule, or am ruling, etc.)					
Aud-iō	*īs*	*it*	*īmus*	*ītis*	*iunt*
(I hear, or am hearing, etc.)					

FUTURE SIMPLE

Amā- / *Monē-*	*bō*	*bis*	*bit*	*bimus*	*bitis*	*bunt*
			(I shall love, warn.)			
Reg- / *Audi-*	*am*	*ēs*	*et*	*ēmus*	*ētis*	*ent*
			(I shall rule, hear.)			

IMPERFECT

Amā- / *Monē-* / *Regē-* / *Audiē-*	*bam*	*bās*	*bat*	*bāmus*	*bātis*	*bant*
			(I was loving, etc.)			

PERFECT

Amāv- / *Monu-* / *Rex-* / *Audīv-*	*ī*	*istī*	*it*	*imus*	*istis*	*ērunt* (or *ēre*)
			(I have loved, or I loved, etc.)			

FUTURE PERFECT

Amāv- / *Monu-* / *Rex-* / *Audīv-*	*erō*	*eris*	*erit*	*erimus*	*eritis*	*erint*
			(I shall have loved, etc.)			

PLUPERFECT

Amav- / *Monu-* / *Rex-* / *Audīv-*	*eram*	*erās*	*erat*	*erāmus*	*erātis*	*erant*
			(I had loved, etc.)			

Subjunctive Mood

Singular 1st person	2nd	3rd	*Plural* 1st	2nd	3rd

PRESENT

Am-em	*ēs*	*et*	*ēmus*	*ētis*	*ent*
Mon-eam	*eās*	*eat*	*eāmus*	*eātis*	*eant*
Reg-am	*ās*	*at*	*āmus*	*ātis*	*ant*
Aud-iam	*iās*	*iat*	*iāmus*	*iātis*	*iant*

IMPERFECT

Amā- / *Monē-* / *Rege-* / *Audī-*	*rem*	*rēs*	*ret*	*rēmus*	*rētis*	*rent*

FOUR REGULAR CONJUGATIONS : PASSIVE VOICE

Indicative Mood

	Singular 1st pers.		2nd	3rd	Plural 1st	2nd	3rd
Present							
Am-	*or*	(I am loved)	*āris*	*ātur*	*āmur*	*āmini*	*antur*
Mon-	*eor*	(I am warned)	*ēris*	*ētur*	*ēmur*	*ēmini*	*entur*
Reg-	*or*	(I am ruled)	*ĕris*	*ĭtur*	*ĭmur*	*ĭmini*	*untur*
Aud-	*ior*	(I am heard)	*īris*	*ītur*	*īmur*	*īmini*	*iuntur*
Future Simple							
Amā-, *Monē*	*bor*		*beris* (or *bere*)	*bitur*	*bimur*	*bimini*	*buntur*
Reg-, *Audi-*	*ar*		*ēris* (or *ēre*)	*ētur*	*ēmur*	*ēmini*	*entur*
Imperfect							
Amā-, *Monē-*, *Regē-*, *Audiē-*	*bar*		*bāris* (or *bāre*)	*bātur*	*bāmur*	*bāmini*	*bantur*

Perfect

Amātus sum, amātus es, amātus est	*Amātī sumus, estis, sunt*
Monitus sum, monitus es, monitus est	*Monitī sumus, estis, sunt*
Rectus sum, rectus es, rectus est	*Rectī sumus, estis, sunt*
Audītus sum, audītus es, audītus est	*Audītī sumus, estis, sunt*

	Singular 1st pers.	2nd	3rd	Plural 1st	2nd	3rd
Future Perfect						
Amāt-, *Monit-*, *Rect-*, *Audīt-*	*us erō*	*us eris*	*us erit*	*ī erimus*	*ī eritis*	*ī erunt*
Pluperfect						
Amāt-, *Monit-*, *Rect-*, *Audīt-*	*us eram*	*us erās*	*us erat*	*ī erāmus*	*ī erātis*	*ī erant*

Subjunctive Mood

	Singular 1st pers.	2nd	3rd	Plural 1st	2nd	3rd
Present						
Am-	*er*	*ēris* (or *ēre*)	*ētur*	*ēmur*	*ēmini*	*entur*
Mone-, *Reg-*, *Audi-*	*ar*	*āris* (or *āre*)	*ātur*	*āmur*	*āmini*	*antur*
Imperfect						
Amā-, *Monē-*, *Regē-*, *Audī-*	*rer*	*rēris* (or *rēre*)	*rētur*	*rēmur*	*rēmini*	*rentur*

Subjunctive Mood (*contd.*)

	Singular 1st pers.	2nd	3rd	Plural 1st	2nd	3rd
Perfect						
Amāt-, *Monit-*, *Rect-*, *Audīt-*	*us sim*	*us sīs*	*us sit*	*ī sīmus*	*ī sītis*	*ī sint*
Pluperfect						
Amāt-, *Monit-*, *Rect-*, *Audīt-*	*us essem*	*us essēs*	*us esset*	*ī essēmus*	*ī essētis*	*ī essent*

Imperative Mood

Present Tense 2nd Sing	2nd Plur	Future Tense 2nd Sing.	3rd Sing.	3rd Plur.
amāre (be thou loved)	*amāmini* (be ye loved)	*amātor* (thou must be loved)	*amātor*	*amantor*
monēre	*monēmini*	*monētor*	*monētor*	*monentor*
regĕre	*regĭmini*	*regĭtor*	*regĭtor*	*reguntor*
audīre	*audīmini*	*audītor*	*audītor*	*audiuntor*

Infinitive Mood

Pres. and Imperfect	Perf. and Pluperfect	Future	Perfect Participle	Gerundive
amā-, *monē-* *rī*; *reg-* *ī*; *audī-* *rī*	*amāt-*, *monit-*, *rect-*, *audīt-* *us esse*	*amāt-*, *monit-*, *rect-*, *audīt-* *um īrī*	*amāt-*, *monit-*, *rect-*, *audīt-* *us, a, um*	*amand-*, *monend-*, *regend-*, *audiend-* *us, a, um*

The student should refer to the notes giving derivation of the verb forms, and trace out all the passive forms.

NOTE. There is an alternative form in 2nd singular, present indicative, passive (*ris* or *re*)—e.g. *amāris* or *amāre*. But the latter is seldom used, on account of confusion with infinitive active and imperative passive (both *amāre*). The perfect participle passive is much used. It forms all the perfect tenses, indicative and subjunctive, with parts of *sum*. It is declined like *bonus*—e.g. *puellae amātae sunt*=the girls have been loved. The gerundive is a verbal adjective ; its use is explained in page 1102

Subjunctive Mood (*contd.*)

	Singular			*Plural*	
1st person	2nd	3rd	1st	2nd	3rd

PERFECT

Amāv- / *Monu-* / *Rex-* / *Audīv-*	*erim*	*eris*	*erit*	*erimus*	*eritis*	*erint*

PLUPERFECT

Amāv- / *Monu-* / *Rex-* / *Audīv-*	*issem*	*isses*	*isset*	*issemus*	*issētis*	*issent*

Imperative Mood

PRESENT

2nd singular	*2nd plural*
Amā (love thou)	*Amate* (love ye)
Mone	*Monēte*
Rege	*Regite*
Audī	*Audīte*

FUTURE

2nd sing	*3rd sing*	*2nd pl*	*3rd pl*
amātō	*amātō* (thou must love, etc.)	*amatote*	*amantō*
monetō	*monētō*	*monetōte*	*monentō*
regitō	*regito*	*regitōte*	*regunto*
audito	*audīto*	*auditote*	*audiuntō*

Infinitive Mood

PRES. AND IMPERF.		PERF. AND PLUPERF.	
ama- / *monē-* / *rege* / *audi-*	*re* (to love, etc.)	*amav-* / *monu-* / *rex* / *audiv-*	*isse* (to have loved, etc.)

Gerund (Verbal Noun)

	Nom. and Acc.	*Gen*	*Dat. and Abl*
amand- / *monend-* / *regend-* / *audiend-*	*um*	*ī*	*ō*

Participles

PRESENT	FUTURE
amans, loving	*amātūrus, -a, -um*
monens	*monitūrus, -a, -um*
regens	*rectūrus -a, -um*
audiens	*audītūrus, -a, -um*

Supines

amatum	*amātū*
monitum	*monitū*
rectum	*rectū*
auditum	*audītū*

NOTE: The gerund and the two supines are verbal nouns or substantives, supplying cases to the infinitive (*see* next col.): thus, *spēs regendi* (genitive of the gerund *regendum*) = the hope of ruling; *mirābile audītū* (abl. of supine) = wonderful to hear.

The participles are verbal adjectives, and are declined as such: future participles like *bonus*, present participles like *ingens*.

The present, perfect, and supine stems must be known in order to conjugate a verb; from these the other parts of the verb may be formed. Therefore it is well to learn what are called the principal parts of every verb; that is, the present infinitive, the perfect indicative, and the supine in *-um*. Thus of *amō* the principal parts are *amāre*, *amāvī*, *amātum*. The table on the facing page will be useful.

Derivation of the Verb Forms

From Present Infinitive stem

Pres. act. and pass.	Infin. pres. a. and p.
Fut. simple a. and p.	Gerund and gerundive
Imperf. a. and p.	Pres. participle act.
Imperative a. and p.	

From Perfect stem

Perfect active	Pluperfect active
Fut. perf. active	Infin. perf. active

From Supine stem

Supines	Perfect pass.
Fut. part. act.	Future perf. pass.
Fut. infin. pass.	Pluperf. pass.
Perf. part. pass.	Perf. infin. pass.

Notice that the imperative active is formed by dropping the *re* from the present infinitive; *amāre*, *amā*; *audīre*, *audī*, etc.

Note also: The present, future, and present perfect (i.e. *amāvi* when translated I have loved, not I loved) are called primary tenses; the imperfect, pluperfect, and simple perfect (*amāvī*, when translated I loved), historic tenses.

It should further be noted that there are three participles wanting in Latin:

(*a*) Act. Perf. Ptc., "having loved." We must use *quum amāvisset* when he had loved, or some similar construction.

(*b*) Pass. Pres. Ptc., "being loved." Say *quī amātur* or *dum* (while) *amātur*.

(*c*) Pass. Fut. Ptc., "about to be loved." Say *quī amābitur* or something similar.

But note carefully that *amātus* does *not* mean "having loved." It means "having been loved."

Infinitive Mood

The infinitive is an indeclinable verbal noun. It is used as object, as predicate and as subject or complement, so far as a substantive in the accusative or nominative case would be so used. It should not be used as a genitive, dative, or ablative, or as an accusative after a preposition. The gerund is used instead.

1. As subject or complement: *Dulce et decorum est pro patria mori* = it is sweet and comely to die for country.

2. As object: *Vincere scis: victoria uti nescis* = you know how to conquer: you do not know how to use your victory.

3. As predicate to a subject in the nominative case: to express the occurrence of actions without marking the order of time. Often used in narration for a finite verb, hence called historic infinitive, e.g.:

Clamare omnes = all cried out. *Rex primo nihil metuere, nihil suspicari* = the king at first feared nothing, suspected nothing.

Gerunds and Supines

1. These are the cases of the infinitive. As mentioned above, the gerund is used to express

the gen., dat., abl., or acc. after a preposition, of the infinitive, e.g.:

Breve tempus satis longum est ad bene honesteque vivendum for living well and honourably, a short time is long enough. *Fugiendo vincimus* = we conquer by fleeing. *Videndi et audiendi delectatio* = the delight of seeing and hearing.

2. The supine in *-um* is an accusative after verbs of motion. It often has a direct, more rarely an indirect, object, e.g.:

ibo lusum = I will go to play. *Deos atque amicos it salutatum ad forum* = he goes to hail the gods and his friends at the forum. *Non ego Graiis servitum matribus ibo* = I will not go to serve Grecian matrons.

NOTE: This supine, with *iri* (pass. infin. of *eo*), forms the fut. infin. pass.: e.g. *rectum iri.*

3. The supine in *-u* is used in the abl. to qualify adjectives in a way which may be classed under the head of "part concerned" (abl. of respect), e.g.:

Formae terribiles visu = forms terrible to see. *Mirabile dictu* = wonderful to say.

The Gerundive

1. The gerundive is confined to transitive verbs. It is usually substituted for the gerund when the gerund has an object expressed; the object is then attracted into the case of the gerundive, which is made to agree with it in number and gender, e.g.:

Caesar comitiali morbo bis inter res agendas correptus est = Caesar was twice seized with epilepsy in the midst of transacting business.

It is often used (like the supine in *-um*, or the fut. ptc.) to express purpose, instead of *ut* with the subj.: *Missus est a senatu ad animos regum perspiciendos* (translate "for the purpose of discovering"). *Hi septemviri fuerunt agris dividendis* ("for dividing lands").

NOTE: The gerundive is used from *utor, fruor, fungor, potior,* all these verbs being originally transitive.

2. The impersonal gerundive implies necessity. This is the usual construction for expressing "must," and the agent is usually put in the dat., not in the abl. with *a* or *ab*:

Bibendum est mihi = I must drink (literally, it is to be drunk by me). *Suo cuique judicio utendum est* = each must use his own judgment.

3. The gerundive is often used as a mere attributive or adjective, meaning obligation, destiny, desert, or possibility.

Deus et diligendus est nobis et timendus = God is both to be loved and feared by us.

Eis otium divitiaeque, optanda alias, oneri miseriaeque fuere = to them leisure and riches, things desirable in other circumstances, were (for) a burden and a misery.

Compound Verbs

Simple verbs are not so often used in Latin as verbs compounded with a preposition, which strengthens or changes the meaning. The following are the chief changes of prepositions in composition: *A, ab* become *ā-* before *m, v* (*āmittō, āvocō*); *abs-* before *c, t* (*abscēdō, abstergō*); *as-* before *p* (*asportō*); *au-* before *f* (*auferō*). But *āfuī* (from *absum*). *Ad* becomes *a-* before *gn, sc, sp* (*agnoscō, ascendō, aspiciō*). It remains *ad-* before *b, d, h, j, m, v,* and vowels, but is assimilated before other consonants: *afferō, assistō.*

Con (for *cum*) and *in,* become *com-, im-,* before *p, b, m* (*compellō, imbuō, immineō*), and are assimilated before *l, r*: *collūdō, irruō.* They remain unchanged before other consonants, except that:

Con- becomes *co-* before *h, gn,* and vowels: *coeō, cognoscō*; and *in* becomes *i-* before *gn*: *ignoscō.* *Ob, sub,* are assimilated before *c, g, p, f*: *occurrō, suggero, suppleō, sufferō*; except *suscipiō, suscitō, suspendō, suspiciō.* They remain before other sounds, except *sustineō, sustollō, sustulī, surripiō, omittō, ostendō.*

E, ex are assimilated before *f*: *efferō.* *Ex-* before vowels, *h, c, q, p, s, t*; *e-* before other consonants: *ēdūcō, ēvocō.* *Trans* becomes *trā-* before *d, j, n*: *trādō, trājiciō, trānō.* *Dis* (inseparable prefix) is assimilated before *f*: *differō.* It becomes *di-* before *s* with consonant (*distringō*) and certain consonants (*diruō*). Note *dirimō* for *disemō.* *Re-* (inseparable prefix) adds *d* in *reddō, redeō, redhibeō, redimō, redoleō.*

In addition to the changes in the prepositions there is a vowel change in the verbs themselves in becoming compounds: e.g. *concutiō* (*quatiō*), *collīdō* (*laedō*), *explōdō* (*plaudō*), *exigō* (*agō*), *conficiō* (*faciō*), *confiteor* (*fateor*), *retineō* (*teneō*), etc. The student must look these up for himself in the dictionary as he comes across them in his reading.

Syntax of Verbs

In Latin if one verb is predicated of two or more subjects, it will be in the plural—e.g. *Puer et puella equum amant* = the boy and the girl love the horse.

If there are two or more subjects of different grammatical persons, the verb agrees with the first person rather than the second, and with the second rather than the third—e.g. *Si tu et Tullia valetis, ego et Cicero valemus* = if you and Tullia are well, Cicero and I are well. (NOTE: The Romans put "I" first: they said, "*ego et Caius,*" where we should say, "Caius and I.")

If the verb in the principal clause is in a *primary* tense the verb in the subordinate clause will be (*a*) in the present subjunctive if present time is denoted; (*b*) in the perfect subjunctive if past time is denoted, e.g.:

Rogavi ut illi ignosceretur = I have asked that he may be pardoned. *Cognoscam cur venerit* = I will ascertain why he came.

But if the verb in the principal clause is in a *historic* tense the verb in the subordinate clause will be (*a*) in the imperfect subj. if present time is denoted; (*b*) in the pluperfect subj. if past time is denoted, e.g.:

Rogavi utrum adesset = I asked whether he were present. *Non dubium erat quin fugisset* = there was no doubt that he had fled.

For irregular verbs *see* Lesson 9, and for peculiarities of verbs *see* Lesson 11.

LESSON 6

Uses of the Cases

ALL that there is need to know about the nominative and vocative cases is that the nominative is the case of the subject of the sentence (answering the question who ? or what ?) and the vocative the case of the person addressed. There is more to learn about the other cases.

The Accusative Case

The accusative is the case of the direct or nearer object of the transitive verb : e.g. *Brutus Caesarem interfecit*, Brutus killed Caesar.

a. Some verbs, especially those of concealing, asking, and teaching, may take two accusatives, one of the person, the other of the thing : e.g. *nihil matrem celat*, he conceals nothing from his mother ; *nunquam divitias deos rogavi*, I never asked riches from the gods.

b. Intransitive verbs may take a cognate accusative, i.e. an accusative of kindred meaning to the verb: e.g. *cursum currere*, to run a race ; *duram servitutem servit*, he serves a hard slavery.

c. Factitive verbs (i.e. verbs of making, calling, thinking, etc.) take two accusatives : e.g. *Ciceronem consulem creant*, they make Cicero consul ; *patriam Britanniam vocamus*, we call our country Britain.

d. Duration of time and measure of space are put in the accusative : e.g. *Victoria multos annos regnavit*, Victoria reigned for many years (here, for = during) ; *muri erant ducenos pedes alti*, the walls were 200 feet high. [Point of time at which, is put in the ablative.]

e. The place whither one goes is put in the accusative, and without a preposition if it is the name of a town or small island, or *domum* (home), *rus* (country) : e.g. *Romam redivit*, he returned to Rome ; *rus eo*, I am going into the country (*rus* is neuter). But *in Italiam eo*, because Italy is not a town or small island.

f. The accusative of respect is rare in prose, common in poetry : e.g. *nudae sunt lacertos*, they are bare as to their arms ; *deo similis humeros*, like unto a god in his shoulders.

g. The accusative is often used in exclamations : really object to some verb understood : e.g. *me miserum !* wretched me ! *O te ferreum !* man of iron that thou art !

h. Some impersonal verbs take the accusative (*see* Lesson 11, page 1117).

The Genitive Case

The genitive denotes : 1. Possession : this is the simplest and most natural use of the genitive : *Caesaris uxor* = Caesar's wife. The gen. sing. of a substantive is often used as a predicate with a copulative verb, to denote such ideas as nature, token, function, duty, part, mark, etc.: *sapientis est tempori cedere* = it is (the mark) of a wise man to yield to circumstances ; *cujusvis hominis est errare* = any man may err.

2. The relation of whole to part : partitive genitive : *multi vestrum* = many of you ; *fortissimus Graecorum* = the bravest of the Greeks ; *duo horum* two of these. Often used after the neut. sing. of adjectives and pronouns expressing quantity or degree, and with *nihil* (nothing), *satis* (enough), *parum* (too little) ; e.g. *parum prudentiae* = too little prudence.

Also used after some adverbs, *quo*, *eo*, *tum*, *ubi*, etc. ; e.g. *ubi gentium* = where in the world ? (*lit*., where of nations ?) ; *eo ferocitatis* = to such a pitch of savagery.

NOTES : (*a*) The whole of the city = *tota urbs* (not *totum urbis*) ; all of us = *nos omnes*, i.e. we all. For in these circumstances we are not dealing with a part. (*b*) It is equally good Latin to say " *viginti e suis servis misit* " (he sent twenty of his slaves) as to say " *viginti servorum misit*."

3. Quality or definition. This is very like the ablative of quality (*see* under ablative, p. 1104), and he substantive in the genitive is always accompanied by an adjective : *vir summae fortitudinis* = a man of the highest courage ; *puer sedecim annorum* = a boy of sixteen years.

4. Price. Used especially with verbs of valuing and esteeming, confined to *pluris*, *minoris*, *tanti*, *quanti* (and their compounds), *magni*, *maximi*, *parvi*, *minimi* : e.g. *parvi sunt foris arma, nisi est consilium domi* = of little value are arms abroad, unless there is a policy at home.

5. The genitive is used after verbs and adjectives signifying power and impotence, innocence, condemnation, acquittal, memory and forgetfulness, and compassion ; e.g. *parricidii eum incusat* = he taxes him with parricide ; *alii, reminiscentes veteris famae, aetatis miserabantur* = others, remembering their former renown, pitied their age.

6. Some impersonal verbs take the genitive (*see* Lesson 11, page 1117).

Subjective and Objective Genitives

Such a phrase as " the love of children " is capable of two meanings : (1) children's love for us, in which case " of children " is subjective genitive ; (2) our love for children, when " children " is objective genitive. Both genitives may be combined in a single phrase ; *Helvetiorum injuriae populi Romani* = the wrongs

done by the Helvetii (subjective) to the Roman people (objective).

The Dative Case

The simplest use of the dative is for the indirect object : e.g. *do librum puero* = I give the boy a book.

The dative is often used after the gerundive (and sometimes after other passive participles) where we should expect the ablative of the agent with the preposition *ab* (*see* 5, next col.): e.g. *hoc mihi faciendum est* = this is to be done (must be done) by me. The predicative dative — that which a thing or person serves as, or occasions—is much used with *sum, do, duco,* and (especially with military terms, *auxilio, praesidio, subsidio*) with verbs of motion : e.g. *quinque cohortes castris praesidio reliquit,* he left five cohorts as a guard to the camp ; *quae res saluti nobis fuit,* which thing was for a safety to us, i.e. saved us ; *ipse sibi odio erit,* he will be an object of hatred to himself, lit., he will be for a hatred.

Impedimento esse = to be a hindrance.
Detrimento esse = to be hurtful, etc.

The dative is sometimes used where we should use a possessive pronoun or the genitive, to give greater emphasis to the person mentioned : *tum Pompeio ad pedes se projecerunt* = then they threw themselves at Pompey's feet.

The dative is used after several verbs. With *sum* it denotes possession : *sunt nobis mitia poma* = we have ripe apples. All the compounds of *sum* (except *possum*) take a dative.

Verbs signifying to aid, favour, obey, please, profit, injure, oppose, displease, command, persuade, trust, spare, envy, be angry, etc., take the dative, because they are really intransitive : e.g. *parce pio generi* = spare a pious race, lit., "be sparing to." *Jubeo* (I order), however, takes the accusative.

These verbs that take a dative cannot be used personally in the passive, but only impersonally : e.g. *mihi persuasum est* = I have been persuaded, lit., it has been persuaded to me.

A few impersonal verbs take a dative (*see* Lesson 11, page 1117).

The Ablative Case

The ablative is, more than any other, an adverbial case ; it is the case of circumstances which attend action and limit it adverbially. It answers the questions : Whence ? How ? From what cause ? When ? Where ?

1. *The ablative of time* answers the questions When ? Within what time ? How long before or after ? (Contrast this with the accusative of time, denoting *duration*—e.g. *decem* annis *post urbem conditam obiit* = he died 10 *years after* the founding of the city ; but *decem* annos *vixit* = he lived *for* 10 *years.*)

2. *The ablative of place* is used without a preposition when the question is "By what road ?" or (of a town or small island) "Whence ?"—e.g. *Ibam forte* Via Sacra = I was going by chance *along the Sacred Way*; Corintho *fugit* = he fled *from Corinth* (so *domo* = from home ; *rure* = from the country).

Under this heading we may treat the locative case, practically obsolete in classical Latin, and largely replaced by the ablative. The locative answered the question Where ? and ended in *-i*—e.g. *domi,* at home ; *ruri,* in the country ; *humi,* on the ground ; *belli,* at the war. The ablative is always used for the locative in names of towns and small islands of the 3rd declension, and in plural names of towns of the 1st and 2nd declensions—e.g. *Athenis,* at Athens ; *Neapoli,* at Naples. But if the town or small island is a singular noun of 1st or 2nd declension, the genitive is used—e.g. *Romae,* at Rome (old locative was *Romai*) ; *Corinthi,* at Corinth.

3. *The ablative of origin* is used after verbs and participles—mostly, though not always, without a preposition—e.g. Jove *natus,* born *of Jupiter.*

4. *The ablative of instrument and cause* : e.g. *Boni oderunt peccare virtutis* amore = the good hate to sin *from love* of virtue (cause) ; gladio *interfectus est* = he was slain *with the sword* (instrument).

5. *The ablative of the agent* is used when the "instrument" is a person, not a thing—the preposition *a* or *ab* is necessary—e.g. *Caesar* a Bruto *pugione interfectus est* = Caesar was slain *by Brutus* with (i.e. by means of) a dagger. (But when "with" = together with, the preposition *cum* must be used—e.g. cum fratre meo *veni* = I came *with my brother.*)

6. *The ablative of manner,* being purely adverbial, is one of the commonest uses of the ablative—e.g. *Injuria fit* duobus modis, *aut* vi *aut* fraude = wrong is done *in two manners,* either *by force* or *by fraud.* Similarly, *hoc modo* = in this manner ; *casu* = by chance ; *consilio* = by design, on purpose ; *jure* = rightly, by right.

7. *The ablative of quality and accompaniment* is used : (*a*) Quality—e.g. *Senex* eximio ingenio = an old man *of wonderful ability.* (The noun in the ablative must have an adjective with it : we could not say "*senex ingenio.*") (*b*) Accompaniment—e.g. *hoc feci* summa diligentia = I have done this *with the utmost care.* (If we omitted the adjective, we should have to insert *cum*—e.g. *hoc feci* cum *diligentia.*)

8. *The ablative of price* is used with verbs of buying and selling, usually where some definite figure is given. (Otherwise, and especially after verbs of valuing and esteeming, the genitive is used.) *Anulum* viginti nummis *vendidit* = he sold the ring for *twenty nummi.*

9. *The ablative of measure*—e.g. *Sol* multis partibus *major est quam luna* the sun is *many times* (lit. *by many parts*) larger than the moon ; quo *citius*, eo *melius*—the sooner, the better (lit. *by what* the sooner, *by that* the better).

10. *The ablative of comparison*—e.g. *Puto mortem* dedecore *leviorem* = I think death easier *than disgrace*. This construction is used only when the comparison is made between two nouns and only when the comparative adjective is nominative or accusative. *Than* can also be expressed by *quam*. In the *quam* construction the two things compared are in the same case, as *Luna minor est* quam sol, the moon is smaller *than the sun*.

11. *The ablative* is used after the following : (*a*) Verbs : Abounding, filling, etc., and their opposites, depriving of, being without. Also the deponent verbs *fruor, fungor, utor, vescor, potior, dignor*. (It is really quite regular to have the ablative after these verbs ; *utor*, for example, means " I serve myself *with*," and so comes to mean " I use.") (*b*) Adjectives : *dignus* (worthy), *indignus* (unworthy), *fretus* (relying on), *contentus* (content with), *praeditus* (endowed with) e.g. laude *dignissimus* - most worthy *of praise*. (*c*) Nouns : *opus* (need) and *usus* (use)—e.g. *opus est mihi* argento = I have need of silver.

The Ablative Absolute

A participle together with a substantive (or pronoun) standing by themselves, independent of the rest of the sentence, are usually both put in the ablative case e.g. The city having been captured, Caesar withdrew = *urbe capta, Caesar se recepit*. These things being finished, the king entered the temple = *his confectis, rex in templum intravit*.

In either of these two sentences, the two words in the ablative could be omitted without impairing the grammatical completeness of the sentence : without them we should still have complete sentences, " Caesar withdrew," " the king entered the temple." Therefore, the words in the ablative are *absolute*, i.e. independent. But in a sentence like this, " The city, having been captured, was burnt," we could not remove the words " the city, having been captured " without ruining the sentence. Therefore this is not " absolute " and " city " is nominative to " was burnt " (*urbs capta* [nominative] *incensa est*).

So the *ablative absolute* cannot be used if what is denoted by its substantive is either the subject of the principal verb of the clause (as in the sentence just given) or the object (as "Caesar, having taken the city, burnt it " = *Caesar captam urbem incendit*—i.e. Caesar burnt the taken city).

Other examples of the ablative absolute are *Regnante Victoria* = in the reign of Victoria (literally " Victoria reigning "). *Nullo respondente* = no one replying. *His auditis* = having heard, or, hearing this (literally " these things having been heard "). *Te non adjuvante* = without your assistance (you not assisting).

The ablative absolute is often used, too, with a noun or adjective instead of a participle :

Me invito = against my will (I being unwilling). *Te duce* = under your leadership (you being leader). *Me auctore* = at my suggestion (I being adviser). *Salvis legibus* = without breaking the laws (the laws being sound).

But do not say *rege pervento*, the king having arrived. This is wrong. There is no passive to an intransitive verb.

Put Exercise I into English and Exercise II into Latin, using the accompanying vocabularies.

EXERCISE I

Si monumentum quaeris, circumspice. Regnum meum non est ex hoc mundo : si ex hoc mundo esset regnum meum, ministri mei certavissent. Multi alios laudant, ut ab illis laudentur. Et Jesus dixit ei, Recipito visum : fides tua te servavit. Nero post Tiberium, sed ante Vespasianum regnavit. Dormiens ambulabat. Amavisse non idem est ac amare. Illi (*dat. sing.*) sit gloria in saecula saeculorum. Ama hanc puellam, sed mone illum puerum ne stultus sit.

Vocabulary

monumentum, -i, a monument
quaerō, -ere, I seek
circumspiciō, -ere, I look round
laudo, -āre, I praise
dīcō, -ere, dīxī, dictum, I say
recipiō, -ere, I receive
visus, -us, sight
fides, -ei, faith
servō, -are, I save
sed, but
dormiō, -ire, I sleep
multī, many (pl.)
glōria, -ae, glory
mundus, -ī, world
minister, -rī, servant
certō, -āre, I strive
ambulo, -are, I walk
ac, as
saeculum, generation
ne, that not
stultus, -a, -um, foolish

EXERCISE II

God rules both the winds and the storms. This thing (omit " thing," and put " this " in neuter) is not the same as that, and never (say " nor ever," *neque unquam*) will be. In (his) dreams he heard himself warning his friends. Experience warns us not (use *ne* with subjunctive mood, negative of *ut*) to hope too much. If she had loved (subjunctive) herself less, she would have been happy. Both you and I will warn this boy not to give (his) books to that poet (say " that he may not give," using *ne*). Caesar himself has said it : therefore it is true. Love glory and not money : so shalt thou show true wisdom. Many of us will blame you on account of this day's deeds. Through waves and storms God leads us to the desired haven.

Vocabulary

both . . and, *et . . et*
wind, *ventus, -ī*
storm, *procella*
dream, *somnium*
experience, *experientia*
I hope, *sperō, -āre*
too much, *nimis*
I give, *dō, dāre, dedi, datum*
so, *ita*
therefore, *ergō*
money, *pecūnia*
I show, *monstrō, -āre*
wisdom, *sapientia*
I blame, *culpō, āre*
deed, *factum*
I lead, *dūcō, dūcere*
desired, *optātus, -a, -u*
haven, *portus, -us*

EXERCISE III

Put the following into Latin, using a dictionary for unknown words :

1. Who was the first to hear about the death of Caesar (say, "Who first heard about dead Caesar ?" The Romans avoided abstract nouns where possible, and used participles instead). 2. The war against the Africani having been finished (*conficio, confēci, confectum*), the soldiers returned home to Britain (return *redeō, redivi, reditum*). 3. Our native land was conquered by the Normans in 1066 (*see* Lesson 10) after the birth of Christ (say, "after the born Christ," *post Christum nātum*). 4. There is no doubt that (*non est dubium quin*, with subjunctive) the sun is larger than the moon. 5. He is too brave to fear death (say, he is braver than that [*ut*] he may fear death). 6. Before us are two paths, the one leads to poverty and right, the other to wealth and shame · I ask you which of the two you choose. ("You choose" must be subjunctive, because it is an indirect question—i.e. it depends on the main verb "I ask".) 7. Be thou faithful unto death, and I will give thee a crown of life. 8 The great Bruce, having watched the spider in the cave, resolved to be *of good courage* (*bono animo*, ablative of quality).

Translation I

Put the following into English, using a dictionary for unknown words :

THE BEATITUDES

Beati (sunt) pauperes spiritu · quoniam ipsorum est regnum coelorum Beati *qui* (*a*) lugent : quoniam ipsi solamen recipient. Beati qui sunt mites quoniam ipsi terram *hereditario jure* (*b*) obtinebunt. Beati qui esuriunt et sitiunt iustitiam · quoniam ipsi saturabuntur. Beati qui sunt misericordes : quoniam ipsis misericordia tribuetur Beati qui sunt *mundo corde* (*c*) quoniam ipsi Deum videbunt. Beati qui sunt pacifici : quoniam filii Dei vocabuntur.

Translation II

THE LORD'S PRAYER

Pater noster qui es in coelis, sanctificetur nomen tuum. Veniat regnum tuum . fiat voluntas tua, sicut in coelo, ita etiam in terra. Panem nostrum quotidianum da nobis hodie. Et remitte nobis debita nostra, sicut *et* (*d*) nos remittimus debitoribus nostris. Et *ne* (*e*) nos inducas in tentationem, sed libera nos a malo. Quia tuum est regnum, et potentia, et gloria, in secula.

NOTES : (*a*) In full, it would be *Beati sunt ii qui*. (*b*) Literally "they shall occupy by hereditary right." (*c*) Ablative of quality, of a pure heart. (*d*) *Et* here = also. *Et* can mean (1) both, (2) and, (3) also, (4) even. (*e*) *Ne* is the negative particle used with imperative and subjunctive : *non* or *haud* with indicative and infinitive. Here *ne inducas* = do not lead us. (This is not a good Latin construction : it should be perfect subjunctive, not present)

Now here is an easy passage to turn into Latin. Before attempting it the order of words in a Latin sentence should be noted. The verb or, if not the verb, some important part of the predicate, usually comes last of all. The verb *sum*, however, seldom concludes a sentence : e.g. *amicus est mihi carissimus*. Adjectives, when used as attributes (a good man), usually *follow* their noun (*vir bonus*). Adverbs usually *precede* their verbs (*graviter dixit*, he spoke weightily).

Translation III

LITTLE BOY BLUE

Once upon a time there was a boy whose name was "Blue" (say, to whom the name was "Blue") When his father had given him a horn to blow (which he might blow), he ordered his son to watch the sheep. But because this boy was very lazy, he often *used to go to sleep* (imperfect) for many hours in the fields, thinking to himself (say, with himself) "To sleep is more pleasant than to work." At last his father found him out . for the oxen which he was watching had entered into the meadow, and the sheep had settled in the cornfield. "Where is Little Boy Blue ?" all the men shouted And by and by they found him under a haycock in the middle of a field – fast asleep ! What did his father give him ?

LESSON 7

Oblique Narration

THE construction known as Oblique Narration (*Oratio Obliqua*), or the Accusative and Infinitive Construction, is one of the most characteristic idioms of Latin. It is especially used where English has a clause beginning with *that* after (1) verbs of saying, knowing, thinking, believing, feeling, (2) impersonal expressions, as "it is clear, true," etc.

The subject is put in the accusative case, and all principal verbs are changed from indicative to infinitive, retaining their original tenses : e.g. he says that the moon is smaller than the sun = *dicit lunam esse minorem sole* (literally, he says the moon to be smaller). I know that I shall die = *scio me moriturum esse*. Instead of *dico . . . non*, Latin uses *nego* = I deny : e.g. he said he did not believe = *negavit se credere*.

All verbs, other than principal verbs (i.e. verbs directly making a statement), are put in the subjunctive. There cannot be an indicative in Oblique Narration.

EXAMPLES. "The slaves whom I now have here are most faithful" is in *Oratio Recta* (Direct Narration), and would be in Latin, "*servi quos nunc hic habeo sunt fidelissimi*." Turning this into "reported speech," or *Oratio Obliqua*, we shall have "he said that the slaves whom he then had there were most faithful" = *dixit servos quos tum ibi haberet esse fidelissimos*. Note the change of "now" into "then," "here" into "there," "I" into "he," "have" into "had," and "are" into "were" ; but we still use *esse* for "were," because *esse* is both present and imperfect infinitive, and *fuisse* would mean "had been." Again : "It is clear that, because the citizens are cowards, the

city will be taken" *manifestum est quod cives ignavi sint urbem captum iri.*

Imperatives in *Oratio Recta* become imperfect subjunctive in *Oratio Obliqua* : e.g. *Recta* : "Charge, my men," said the general = "*Instate, milites,*" *inquit imperator. Obliqua* : The general said to his soldiers, "Let them charge" = *Imperator militibus dixit, Instarent.*

Questions in the first and third persons are rendered in *Oratio Obliqua* by the accusative of the person and the infinitive of the verb ; but questions in the second person become imperfect or pluperfect subjunctive : e.g. (they said) why is our general absent ? = *cur abesse imperatorem ?* (he said) why are you advancing ? = *cur progrederentur ?*

Ego, tu, nos, vos, cannot find a place in *Oratio Obliqua* ; *ego* and *nos* become *se*, *tu* becomes *ille*, and *vos* becomes *illi*.

Se and *suus* refer, as a rule, to the speaker : e.g. he says that he will come = *dicit se venturum esse*. He said, "let them not forget his kindnesses" *ne suorum beneficiorum obliviscerentur.*

If, however, *suus* is wanted to refer to the subject of some subordinate verb (e.g. *obliviscerentur*, above), then *ipse* is used to refer to the speaker : e.g. let them not forget their own cowardice or his kindnesses - *ne suae ignaviae aut ipsius beneficiorum obliviscerentur.*

NOTE : The translation of the English conjunction *that* needs great care. When it means "in order that," "so that" (as "he walked fast that he might warm himself"), it should be translated by *ut* with subjunctive. When it means "the fact that," after any verb or phrase *sentiendi vel declarandi* ("of feeling or stating"), the accusative with the infinitive must be used. In English we can say, "you were ill, he thought, and therefore absent." But in Latin we must say, "he thought that you were ill, etc." (*putavit te aegrotare*).

Translation I

Put the following into English, using a dictionary for unknown words :

Si linguis hominum loquar et angelorum, caritatem autem non habeam, factus sum aes resonans aut cymbalum tinniens. Et si habeam prophetiam et noverim mysteria omnia, omnemque cognitionem, et si habeam totam fidem, adeo ut montes transferam, caritatem autem non habeam, nihil sum. Et si insumam *alendis egenis* (*a*) omnia quae mihi suppetunt, et si tradam corpus meum ut comburar, caritatem autem non habeam, hoc nihil mihi *prodest* (*b*). Caritas iram cohibet, benigna est caritas, non invidet caritas, non agit perperam, non inflatur . non agit indecore, non quaerit quae sua sunt, non exacerbatur, non cogitat malum. Non gaudet injustitia, gratulatur autem veritati ; omnia tegit, omnia credit, omnia sperat, omnia sustinet : caritas nunquam excidit . sed et prophetiae evanescent, et linguae cessabunt, et cognitio evanescet. Ex parte enim cognoscimus, et ex parte prophetamus. Postquam autem advenerit quod perfectum est, tunc quod est aliquatenus, *ut* (*c*) inutile, tolletur. Quum essem infans, ut infans loquebar, ut infans sapiebam, ut infans ratiocinabar . postquam autem factus sum vir, ut inutilia *sustuli* (*d*) quae infantis erant. Cernimus enim nunc per speculum et per aenigma, tunc autem coram cernemus · nunc novi aliquatenus, tunc vero amplius cognoscam, prout amplius edoctus fuero. Nunc vero manet fides, spes, caritas, tria haec : maxima autem harum caritas.

NOTES . (*a*) dative of gerundive -- for feeding the needy. (*b*) from *prosum prodesse, profui*. (*c*) *Ut* with indic., or used without a verb, means "as." (*d*) perfect of *tollo* (borrowed from *suffero*)

Latin prose composition can be learned only by long and constant practice Below will be found a passage for translation into Latin. This done, the student should compare his rendering with the Latin version (*see* end of following Lesson, page 1110), and then translate the latter literally into English, after which he should compare his English version with the English version as given below. This will give him a good idea of the difference between the English and the Latin ways of expressing ideas. Accuracy and clearness are the first essentials, and then the style should be polished by constant comparison with the style of the best Latin authors, such as Livy and Cicero. Hints on style will be given from time to time during the remainder of this Course.

Translation II

The inhabitants of this island were so bold that they would have preferred a thousand deaths (say, "to die six hundred times" : the Romans said "six hundred" where we should say "a thousand" or "a hundred," to mean a very large number, perhaps because the Roman cohort originally consisted of 600 men) to disgrace, if the choice had been necessary. One brave farmer was asked why he would sooner die nobly on the field of battle than live ignobly at home. He replied, "Because I am more afraid of shame than of death." It happened once that they were invaded by the powerful nation of the Ventidii, who landed on their shores, marched up to their capital, devastated the country all round, and then laid siege to the city. The citizens determined to resist with boldness. Instead of throwing themselves at their enemies' feet, they sent away their families, their old men and their treasures, and prepared to resist with desperation. Though they were prevented by scruples from committing suicide, they promised one another to fight so desperately that the enemy should not take them alive. When they were all assembled in arms, their general addressed them thus : "Remember, citizens, that victory or death awaits you. I will say no more , the enemy is at the gates. What reason is there for delaying ?"

KEYS TO EXERCISES IN LESSON 6

(I) If you seek a monument, look around. My kingdom is not of (literally "from") this world , if my kingdom were of this world, my servants would have striven (*si* usually takes subjunctive). Many men praise others, in order that they may be praised by them. And Jesus said to him, Receive (thy) sight . thy faith has saved thee. Nero reigned after Tiberius, but before Vespasian. He used to walk (note the force of the imperfect) in his sleep (literally "sleeping," pres. part. of *dormio*). "To have loved" is not the same (thing) as "to love." To him be the glory for generations of generations (a frequent use of *in* during, for). Love this girl, but warn that boy not to be foolish (that he may not be : *ne* is negative of *ut*, which in order that, so as to).

(II) Deus et ventos et procellas regit. Hoc non est idem (neut.) ac illud, neque unquam erit. In somnis se audivit amicos monentem (acc. of present participle, agreeing with *se*). Experientia nos monet ne nimis speremus. Si se (*or* ipsam) minus amavisset, fuisset beata. Et ego et tu hunc puerum monebimus ne libros illi poetae det. Caesar ipse hoc dixit : ergo verum est. Ama gloriam non pecuniam : ita veram sapientiam monstrabis. Multi nostrum te (*or* vos) ob hujus diei facta culpabimus. Per undas et procellas (*or* procellasque) Deus nos ad optatum portum (*not* dative) ducit.

(III) 1. Quis primus de mortuo Caesare audivit ? 2. Bello contra Africanos confecto, milites domum in Britanniam redierunt. 3. Patria nostra a Normannis anno millesimo sexagesimo sexto post Christum natum superata est. 4. Non est dubium quin sol sit major quam lunā (nom.), *or* lunā (ablative, without *quam*). 5. Fortior est quam ut mortem timeat. 6. Ante nos sunt duae viae ; altera ad paupertatem et honesta (acc. neut. plu., honourable things), altera ad divitias et dedecus ducit : rogo utram deligatis. 7. Esto fidelis usque ad mortem, et dabo tibi coronam vitae. 8. Ille Brutius, quum araneam in antro observavisset, esse bono animo constituit.

KEYS TO TRANSLATIONS IN LESSON 6

I. *See* The Bible : Matthew 5, vv. 3-9.
II. *See* The Bible : Matthew 6, vv. 9-13.

CAERULEUS

III. Olim erat puer cui nomen erat Caeruleo (dat. in apposition to *cui*). Ubi pater cornu ei dederat quod inflaret, filium oves servare jussit (perf. of *jubeo*). Quia autem (*autem* is never first word in a sentence) hic puer erat pigerrimus, multas horas in agris saepe dormiebat, secum reputans, "Dormire est jucundius (neuter) quam laborare." Tandem pater illum deprehendit : nam boves quos servabat in pratum intraverant, atque oves in agro frumentario consederant (plupf. of *consido*). "Ubi est Caeruleus ?" omnes conclamaverunt. Denique illum reppererunt (perf. of *reperio*) sub foeni meta in medio agro (note that the Romans said "in the middle field") dormientem. Quid illi pater dedit ? (perf. of *do, dare*).

NOTE : Instead of *Denique illum reppererunt* it is better Latin to say *quem denique reppererunt*, whom at length they found. In Latin the relative is often used where in English we use the demonstrative. This is an example of a very characteristic difference between the Latin and English idioms. This, and other differences in idiom, should be carefully noted by the student when he comes across them, as knowledge of them is essential for translation.

LESSON 8

Uses of the Subjunctive Mood

ONE of the most difficult subjects in Latin is the subjunctive mood. English usage gives no guidance, and, in fact, the subjunctive is as common in Latin as it is rare in English. In the following sentences, for example, the words in italics would be in the subjunctive mood in Latin : "It was so cold that the water *froze*" (consecutive after *ut*). "I asked why he *did* this" (indirect question). "I fear that you *are* ill." "He said that the man who *did* this should die" (dependent verb in Oratio Obliqua). "There is no doubt that twice two *are* four." Roughly, one may say that the indicative indicates a fact, while the subjunctive expresses "something which we regard rather as a mere conception of the mind, as that which we purpose or wish to be a fact, or to which we refer as the result of another fact, or as stated on other authority than our own."

As a general rule the subjunctive is used in certain classes of subordinate or *subjoined* clauses. But it is also used both in simple sentences and in the main clause of a compound sentence, as follows :

1. To make a statement in a hesitating manner, sometimes called the potential mood. This is strictly a hypothetical subjunctive with the condition not formally expressed. *Hoc dicere ausim* = I would dare to say this (if I were allowed).

2. To ask a question, rhetorically, not for information ; sometimes called dubitative questions. Usually a negative answer is expected. *Quis credat ?* = who would believe ?

3. To express a wish or desire (optative or jussive), often with *utinam* (=would that !). Negative *ne*. *Utinam adfuisset* = would he had been present ! *Di Carthaginem deleant* = may the gods destroy Carthage !

Nine Main Uses

Only in these classes of sentences is the subjunctive found in simple or principal sentences. In all the rest it is in subordinate sentences. Including those given above, there are nine main uses of the subjunctive :

(i). *Hypothetical*: *see* No. 1 above. In these sentences the protasis (the *if* clause of a conditional sentence) is suppressed.

(ii). *Conditional*—e.g. *Si jussisses* (protasis), *fecissem* (apodosis) = if you had bidden, I should have done it.

(iii). *Optative*, jussive, or concessive (*see* No. 3 above). "The imperative is the language of an absolute master ; the subjunctive is a suggestion to an equal or superior."

In concessive sentences, a person rhetorically commands or supposes a change of what he knows or believes to be the fact.

(iv). *Rhetorical*: *see* No. 2 above. A question is sometimes asked as a more graphic substitute for a contrary statement :-

Quis credat ? virtually means *Nemo credit* = No one believes.

(v). *Final*, expressing purpose (negative *ne*).
(*a*) In adjectival sentences : *Dignus est qui vincat* = he is worthy to conquer.
(*b*) In sentences introduced by *ut* (in order that), *ne*, *quo*, *quominus*, *quin* : *Ede ut vivas* = eat that you may live.
(*c*) In sentences of time or condition, with *dum*, *dummodo*, *donec*, *priusquam*, etc. : *Oderint dum metuant* = let them hate provided they fear.

(vi) *Consecutive*, expressing result ; usually with *ut* = so that (negative, *ut non*) : *Tam debilis sum ut non ambulare possim* = I am so feeble that I cannot walk. *Is sum qui illud faciam* = I am the man to do that.

(vii) *Subjunctive of attendant circumstances* : *Quae quum ita sint, hoc dico* = under these circumstances (lit. since which things are so), I say this. *Peccavisse videor qui illud fecerim* = I seem to have sinned inasmuch as I have done that.

(viii) *Subjunctive of reported statements*, comprising sentences of definitions, reasons, and questions, which are given *not as the speaker's own*, but as someone else's.

Contrast " Laudat puerum quod *fuit* abstinens " (the reason alleged being given on the speaker's own authority) with " Laudat puerum quod *fuerit* abstinens " (the reason being a reported or assumed one, " He praises the boy, because he understands him to be abstemious ").

(ix) *Subjunctive* because dependent on another subjunctive or infinitive. In all such sentences the subjunctive simply prevents the speaker from being supposed to be responsible for the statements, etc., reported, or to be giving them as independent assertions. To this head, of course, belongs the subjunctive in Oratio Obliqua.

(*a*) Depending on infinitive : *Dicit eos qui boni sint beatos esse* (he says that those who are good are happy).

(*b*) Depending on another subjunctive : *Petit ut iis qui adfuerint credamus* (he asks that we should believe those who were present). In such a case as this it is often said that *adfuerint* is *attracted* into the subjunctive by *credamus*.

Translation I

The numbers at side of words indicate the order in which they are to be taken : note them carefully. Letters in brackets refer to the notes at the end of the passage.

CAESAR'S FIRST LANDING IN BRITAIN

Quod (*a*)[4] ubi[1] Caesar[2] animadvertit,[3] naves (*b*)[7] longas,[6] quarum[8] et[9] species[10] erat[11] barbaris[13] inusitatior,[12] et[14] motus[15] ad[17] usum[18] expeditior,[16] paulum[20] removeri[19] ab[21] onerariis[23] navibus,[22] et[24] remis[26] incitari,[25] atque[27] inde[28] fundis,[33] sagittis,[34] tormentis,[35] hostes[29] propelli[30] ac[31] submoveri[32] jussit[5] Quae[1] res[2] magno[4] usui[5] nostris[6] fuit[3]. Nam,[1] et[3] navium[5] figura,[4] et[6] remorum[8] motu,[7] et[9] inusitato[10] genere[11] tormentorum[12] permoti (*c*),[2] barbari[13] constiterunt (*d*)[14] ac[15] paulum[19] modo[18] pedem[17] retulerunt (*e*).[16] Atque,[1] nostris[2] militibus[3] cunctantibus (*f*),[4] maxime[5] propter[6] altitudinem[7] maris,[8] qui (*g*)[9] decimae[12] legionis[13] aquilam[11] ferebat,[10] contestatus (*h*)[14] Deos,[15] ut[16] ea[17] res[18] legioni[21] feliciter[20] eveniret[19] : " Desilite ",[2] inquit,[1] " commilitones,[3] nisi[4] vultis (*i*)[5] aquilam[7] hostibus[8] prodere[6] : ego[9] certe[10] meum[12] reipublicae[14] (*from* respublica) atque[15] imperatori[16] officium[13] praestitero " (*k*).[11] Hoc[3] cum (*l*)[1] magna[4] voce[5] dixisset,[2] ex[8] navi[9] se[7] projecit (*m*),[6] atque[10] in[14] hostes[15] aquilam[13] ferre[12] coepit.[11] (From Caesar, De Bello Gallico, Book IV, chap. 25.)

NOTES : (*a*) *Quod* : acc. of *qui*, governed by *animadvertit*. We say, " When Caesar perceived this " , the Romans said, " Which thing when Caesar perceived "

(*b*) *Navis longa* = a ship of war.

(*c*) *Permoti* (from *permoveo*) is nom. pl. of perf participle passive, agreeing with *barbari*. " The barbarians, having been influenced by the shape of the ships," etc. *Figura, motu* and *genere* are abl. after *permoti*.

(*d*) Perfect of *consisto*.

(*e*) Perfect of *refero*.

(*f*) Ablative absolute

(*g*) *Qui* = he who.

(*h*) *Contestatus* = calling to witness (though passive in form, it is active in meaning).

(*i*) Second pl. pres. indic. from *volo*, I wish.

(*k*) Fut. perf. of *praesto*, I discharge.

(*l*) *Cum* is another form of *quum*, when.

(*m*) Perfect of *projicio*.

Translation II

The following passage, " How to procure contentedness," by Jeremy Taylor, should be turned into Latin prose with the aid of a dictionary, afterwards correcting the attempt by the Latin version given at the end of Lesson 9, page 1112.

If then thou fallest from thy employment in public, take sanctuary in an honest retirement, being indifferent to thy gain abroad or thy safety at home. If thou art out of favour with thy prince, secure the favour of the King of kings, and then there is no harm come to thee. And when Zeno Citiensis lost all his goods in a storm, he retired to the studies of philosophy, to his short cloak and a severe life, and gave thanks to fortune for his prosperous mischance When the north wind blows hard and it rains sadly, none but fools sit down in it and cry . wise people defend themselves against it with a warm garment or a good fire and a dry roof. When the storm of a sad mischance beats upon our spirits, turn it into some advantage by observing where it can serve another end, either of religion or prudence, or more safety or less envy , it will turn into something that is good, if we list to make it so.

Translation III

Put the following into English, using a dictionary before consulting the translation (end of Lesson 9, page 1112).

PERORATION OF CICERO'S SECOND PHILIPPIC

Respice, quaeso, aliquando rempublicam, M. Antoni : quibus ortus sis, non quibuscum vivas considera : mecum, ut voles · redi cum republica in gratiam. Sed de te tu videris ego de me ipso profitebor Defendi rempublicam adolescens, non deseram senex : contempsi Catilinae gladios, non pertimescam tuos. Quin etiam corpus libenter obtulerim, si repraesentari morte mea libertas civitatis potest : ut aliquando dolor populi Romani pariat, quod jam diu parturit. Etenim si abhinc annos prope viginti hoc ipso in templo negavi posse mortem immaturam esse consulari, quanto verius nunc negabo seni ? Mihi vero, patres conscripti, jam etiam optanda mors est, perfuncto rebus iis quas adeptus sum quasque gessi. Duo modo haec opto , unum ut moriens populum Romanum liberum relinquam—hoc mihi majus ab dis immortalibus dari nihil potest—alterum, ut ita cuique eveniat ut de republica quisque mereatur.

NOTE : *Perfuncto* is dat. of the perf. ptc., agreeing with *mihi* . it governs an abl., being a compound of *fungor*.

Keys to Translations in Lesson 7

I. *See* The Bible, I Corinthians, 8.

II. Qui in hac insula habitabant ii omnes quum essent summa audacia praediti, sescentiens mortem quam semel, si optandum fuisset (gerundive—"if it had to be chosen, if choice had to be made") infamiam obire maluissent. E quibus agricola quidam, vir fortissimus, rogatus cur potius vellet militiae per virtutem emori quam per dedecus domi vivere, respondit se ignominiam magis quam mortem timere. Quibus ita accidit ut Ventidii, quae gens erat potentissima, in eorum fines navibus ingressi, agris undique vastatis, urbem quam maximam habebant obsiderent. Sed quum civibus visum esset sibi quam acerrime hostibus obstandum (gerundive), tantum aberat ut se iis ad pedes dejicerent ut, pecuniis et liberis et senibus dimissis, sese ad resistendum accingerent ut (as) qui de suis rebus desperarent. Religione quidem obstricti quominus sibi mortem consciscerent, alii tamen aliis pollicebantur sese acrius pugnaturos quam qui ab hostibus vivi caperentur. Quos quum armatos imperator convocasset (shortened form of *convocavisset*), jussit meminisse aut victoriam aut mortem obeundam: se non plura dicturum; hostes illis ad portas adesse: quid causae (partitive genitive, literally "what of reason") esse cur jam morarentur?

LESSON 9

Irregular Verbs

There are a few irregular verbs in the first conjugation, rather more in the second and fourth, and a great many more in the third conjugation. Together, they make a formidable list, but if the student memorises a few at a time and familiarises himself with them in his reading and translating, he will soon master them.

FIRST CONJUGATION

Perfect -*uī* Supine -*itum*

crepo	*crepāre*	*crepui*	*crepitum*	creak

Similarly, *cubo* (lie down), *domō* (tame), *plicō* (fold), *sonō* (sound), *tono* (thunder), *vetō* (forbid).

Perfect -*ui*. Supine -*tum*

secō	*secāre*	*secuī*	*sectum*	cut

Perfect reduplicated. Supine -*tum*

dō	*dare*	*dedi*	*datum*	give
sto	*stāre*	*steti*	*statum*	stand

Perfect -*vī*. Supine -*tum*

juvo	*juvāre*	*jūvi*	*jutum*	help
lavo	*lavāre*	*lāvī*	*lōtum* or *lavātum*	wash

Note. Compounds of *do* are of third conjugation, and make -*didi*, -*ditum* (except *circumdō*, *pessumdō*, and *venumdō*, which make -*dedi*, -*datum*). Compounds of *stō* form -*stiti*, -*stitum*.

SECOND CONJUGATION

Perfect -*vi*. Supine -*tum*

deleō	*dēlēre*	*dēlēvī*	*dēletum*	blot out

(So also *fleō* – weep, and -*pleō* fill.)

Perfect -*ui* Supine -*tum*

doceō	*docēre*	*docui*	*doctum*	teach
misceō	*miscere*	*miscui*	*mistum*	mix
teneō	*tenēre*	*tenuī*	*tentum*	hold

Perfect -*si*, *xi*. Supine -*tum*

torqueō	*torquēre*	*torsī*	*tortum*	twist
augeō	*augēre*	*auxi*	*auctum*	increase
lūgeō	*lugēre*	*luxi*	—	mourn

Perfect -*sī* Supine -*sum*

mulceō	*mulcere*	*mulsi*	*mulsum*	soothe

Similarly, *ardeō* (take fire), *rīdeō* (laugh), *suādeo* (advise), *maneō* (remain), *jubeō* (order, perf *jussi*), *haereō* (stick), *fulgeō* (glitter).

Perfect reduplicates. Supine -*sum*

mordeō	-*ēre*	*momordi*	*morsum*	bite
pendeō	-*ēre*	*pependī*	*pensum*	hang
spondeō	-*ēre*	*spopondi*	*sponsum*	pledge
tondeō	-*ēre*	*totondī*	*tonsum*	shear

Perfect -*ī*. Supine -*sum*

prandeō	-*ēre*	*prandī*	*pransum*	dine
sedeō	-*ēre*	*sēdī*	*sessum*	sit
videō	-*ēre*	*vīdi*	*vīsum*	see

Perfect -*ī*. Supine -*tum*

caveō	-*ere*	*cāvī*	*cautum*	beware
faveo	-*ere*	*favī*	*fautum*	favour
foveō	-*ēre*	*fōvi*	*fōtum*	cherish
moveō	-*ēre*	*mōvī*	*mōtum*	move
voveō	-*ere*	*vōvi*	*vōtum*	vow

Also three deponents (passive in form, active in meaning):

fateor	*fateri*	*fassus*	confess
misereor	*miserērī*	*misertus* or *miseritus*	have pity on
reor	*rērī*	*ratus*	think

THIRD CONJUGATION

The following, while apparently of the fourth conjugation, are really third: *capiō*, *cupiō*, *faciō*, *fodiō*, *fugiō*, *jaciō*, *pariō*, *rapiō*, *sapiō*, *quatio* compounds of *speciō* and *laciō*, *gradior*, *patior*, *morior*, and in some tenses *orior* and *potior*. In their present stem forms they usually retain the -*i*, but not before *i*, final *e*, and short *er*. e.g. *capiam*, *cape*, *capere*, *capiendum*. *Morior* and *orior* have future participles—*moriturus* and *oritūrus*. *Orior* is conjugated like *patior*, except a few forms which follow the fourth conjugation *oriri*, *orirer*, etc. *Potior* follows the fourth, but occasionally wavers between third and fourth: *poterer* and *potirer*.

Stems with Back Consonants, -*sī*, -*tum* (five, -*sum*)

dīco	*dixī*	*dictum*	say
dūcō	*duxi*	*ductum*	lead
cingō	*cinxī*	*cinctum*	surround
coquō	*coxī*	*coctum*	cook
fingō	*finxi*	*fictum*	fashion
pingō	*pinxī*	*pictum*	paint
jungō	*junxī*	*junctum*	join
tegō	*texī*	*tectum*	cover
-*stinguō*	*stinxī*	*stinctum*	quench
tinguō	*tinxi*	*tinctum*	dye
unguō	*unxī*	*unctum*	anoint
trahō	*traxī*	*tractum*	draw
vehō	*vexī*	*vectum*	carry
vīvō	*vixi*	*victum*	live
struō	*struxī*	*structum*	pile
-*laciō*	*lexī*	*lectum*	entice
-*speciō*	*spexi*	*spectum*	espy
fluō	*fluxi*	*fluxum*	flow
figō	*fixi*	*fixum*	fix
mergō	*mersī*	*mersum*	drown
spargō	*sparsī*	*sparsum*	sprinkle
tergo	*tersī*	*tersum*	wipe

Stems with Point Cons., -*sī*, -*sum*

claudō	*clausī*	*clausum*	shut

Similarly, *dīvidō*, *laedō*, *lūdō*, *plaudō*, *rādō*, *rōdō*, *trūdō*, and *vādō*. Also:

cēdō	*cessī*	*cessum*	yield
mittō	*misī*	*missum*	send
quatiō	(*quassī*)	*quassum*	shake
flectō	*flexī*	*flexum*	bend
nectō	*nexī*	*nexum*	bind

Stems with Lip Cons., *-sī*, *-tum*

carpō	*carpsī*	*carptum*	pluck

Also *rēpō*, *sculpō*, *serpō*, *nūbō* (*nupsī*), and *scrībō* (*scripsī*).

Stems with *-m-* or *-r-*, *-sī*, *-tum* (one, *-sum*)

cōmō	*compsī*	*comptum*	adorn

Also *dēmō*, *prōmō*, *sūmō*, *temnō*, *premō* (*pressī*, *pressum*), *gerō* (*gessī*, *gestum*) *urō* (*ussī*, *ustum*).

Stems various, *-uī*, *-tum* (one, *-sum*)

cumbō	*cubuī*	*cubitum*	lie down
ēliciō	*ēlicuī*	*ēlicitum*	entice forth

Also *strepō*, *fremō*, *gemō*, *tremō*, and *vomō*

rapiō	*rapuī*	*raptum*	seize
alō	*aluī*	*altum*	nourish

Also *colō* (*coluī*, *cultum*), *consulō*, *occulō*, *pōnō* (*posuī*, *positum*), *gignō* (*genuī*, *genitum*), *texō* (*texui*, *textum*), *serō* - I join (*seruī*, *sertum*), and *metō* (*messui*, *messum*)

Present Stem anomalous, *-vī*, *-tum*

linō	*lēvi*	*litum*	smear
sinō	*sīvī*	*situm*	allow
cernō	*crēvi*	*crētum*	sift, discern
cresco	*crēvī*	*crētum*	grow
spernō	*sprēvi*	*sprētum*	despise
sterno	*strāvī*	*stratum*	strew
serō	*sēvi*	*satum*	sow
nosco	*nōvī*	*notum*	know
pascō	*pavi*	*pastum*	feed [-ed
suesco	*suēvī*	*suetum*	be accustom
quiescō	*quiēvi*	-	rest
cupio	*cupīvi*	*cupitum*	desire
sapiō	*sapivi*	--	be wise
petō	*petivī*	*petitum*	ask
quaerō	*quaesīvi*	*quaesītum*	seek
terō	*trīvī*	*tritum*	rub
arcessō	*arcessivi*	*arcessītum*	send for
lacesso	*lacessīvī*	*lacessitum*	provoke

-ī, *-sum* (one, *-tum*)

pando	*pandi*	*pansum* (*passum*)	spread

Also *scando*, *prehendō*, *-fendō*, *vertō* (*verti*, *versum*), *ibō* (*bibi*, *bibitum*), *vello* (*velli* or *vulsī*, *vulsum*).

findo	*fidi*	*fissum*	cleave
scindō	*scidī*	*scissum*	tear

Perfect reduplicates Supine, *-tum* or *-sum*

pendō	*pependī*	*pensum*	weigh
tendō	*tetendi*	*tensum* (*tentum*)	stretch
discō	*didici*	—	learn
posco	*poposcī*	---	demand
currō	*cucurri*	*cursum*	run
pungo	*pupugi*	*punctum*	prick
tundo	*tutudi*	*tunsum* or *tūsum*	thump
fallō	*fefellī*	*falsum*	deceive
parcō	*pepercī*	*parsum*	spare
pariō	*peperi*	*partum*	bring forth
cadō	*cecidi*	*casum*	fall
caedō	*cecīdī*	*caesum*	cut, beat
canō	*cecini*	*cantum*	sing
pangō	*pepigī*	*pactum*	fasten
tangō	*tetigi*	*tactum*	touch
pellō	*pepulī*	*pulsum*	drive
tollō	(*sustuli*)	(*sublātum*)	raise

-ī with lengthened stem-vowel, *-tum* (three, *-sum*)

faciō	*fēcī*	*factum*	do, make
jaciō	*jēci*	*jactum*	throw
linquō	*līquī*	*-lictum*	leave
vincō	*vīcī*	*victum*	conquer
agō	*ēgī*	*actum*	do, drive
frangō	*frēgī*	*fractum*	break
legō	*lēgī*	*lectum*	choose, read
fugiō	*fūgī*	*fugitum*	flee
edō	*ēdī*	*ēsum*	eat
fodiō	*fōdī*	*fossum*	dig
fundō	*fūdi*	*fūsum*	pour
capiō	*cēpī*	*captum*	take
rumpō	*rūpī*	*ruptum*	break
emō	*ēmī*	*emptum*	buy

U-Verbs

-ī, *-tum*

uō	*acuī*	*acūtum*	sharpen

Also, *arguō* (prove), *exuō* (put off), *induō* (put on), *ibuō* (tinge), *minuō* (lessen), *statuō* (set up), *tribuō* (assign). *Metuō* (fear) and *nuō* (nod) have no supine.

luō	*lui*	*luitum* or *lūtum*	wash, atone
ruō	*ruī*	*rūtum*	rush, fall
solvō	*solvi*	*solūtum*	loosen
volvō	*volvī*	*volūtum*	roll

Deponents

Pres	Infin.	Pf Ptc.	
ngor	*-ī*	*functus*	perform
nplector	*-ī*	*amplexus*	embrace
tor	*-ī*	*nīsus* or *nixus*	strive
tior	*-ī*	*passus*	suffer
or	*-ī*	*usus*	use
adior	*-ī*	*gressus*	step
bor	*-ī*	*lapsus*	glide
orior	*-ī*	*mortuus*	die
teror	*-ī*	*questus*	complain
uor	*-ī*	*fruitus* (*fructus*)	enjoy
quor	*-ī*	*locūtus*	speak
quor	*-ī*	*secūtus*	follow
iscor	*-ī*	*aptus*	obtain
mminiscor	*-ī*	*commentus*	devise
pergiscor	*-ī*	*experrectus*	wake up
tiscor	*-ī*	*fessus*	grow tired
iscor	*-ī*	*irātus*	be angry
nciscor	*-ī*	*nactus*	obtain
iscor	*-ī*	*natus*	be born
bliviscor	*-ī*	*oblītus*	forget
iciscor	*-ī*	*pactus*	bargain
oficiscor	*-ī*	*profectus*	set out
ciscor	*-ī*	*ultus*	avenge

FOURTH CONJUGATION

-uī or *-īvī*, *-tum*

aperiō	*aperui*	*apertum*	open
operiō	*operuī*	*opertum*	cover
salio	*salui*	(*saltum*)	leap
sepeliō	*sepelīvi*	*sepultum*	bury

-ī, *-tum*

comperio	*comperī*	*compertum*	find
reperio	*repperi*	*repertum*	discover
veniō	*vēni*	*ventum*	come

-sī, *-tum* (one, *-sum*)

fulciō	*fulsī*	*fultum*	prop
sanciō	*sanxī*	*sanctum*	consecrate
vinciō	*vinxi*	*vinctum*	bind
hauriō	*hausī*	*haustum*	drain
sentiō	*sensi*	*sensum*	feel

Deponents

assentior	*-īrī*	*assensus*	agree to
experior	*-īrī*	*expertus*	try
mētior	*-īrī*	*mensus*	measure
opperior	*-īrī*	*oppertus*	wait for
ordior	*-īrī*	*orsus*	begin
orior	*-īrī*	*ortus*	rise
potior	*-īrī*	*potītus*	acquire

Translation

It was the funeral-day of the late man who made himself to be called Protector. And though I bore but little affection, either to the memory of him, or to the trouble and folly of all public pageantry, yet I was forced by the importunity of my company to go along with them, and be a spectator of that solemnity, the expectation of which had been so great that it was said to have brought some very curious persons

(and no doubt singular virtuosos) as far as from the mount in Cornwall and from the Orcades. I found there had been much more cost bestowed than either the dead man, or indeed death itself, could deserve. There was a mighty train of black assistants, among which, too, divers princes in the persons of their ambassadors (being infinitely afflicted for the loss of their brother) were pleased to attend ; the hearse was magnificent, the idol crowned, and (not to mention all other ceremonies which are practised at royal interments, and therefore by no means could be omitted here) the vast multitude of spectators made up, as it uses to do, no small part of the spectacle itself

KEYS TO TRANSLATIONS IN LESSON 8

I. When Caesar perceived this, he ordered the ships of war (of which both the appearance was more novel to the barbarians, and whose movement was quicker for use) to be moved a little from the vessels of burden – i.e. transports – and to be urged forward by oars, and then the enemy to be driven back and dislodged by slings, arrows, and engines. This thing was (for) a great advantage to our (men). For, having been influenced both by the shape of the ships and by the motion of the oars and by the unusual kind of engines, the barbarians halted, and drew back (their foot) just a little And, as our men were hesitating, mostly on account of the depth of the sea, he who carried the Eagle (standard) of the 10th legion, calling the gods to witness that that thing would turn out luckily for the legion, says, "Leap down, fellow-soldiers, unless you wish to hand over the Eagle to the foe. I, at any rate, will have discharged my duty to the republic and to the general." When he had said this with a loud voice, he threw himself from the ship and began to carry the Eagle against the foe.

II. Honore amisso in honestum otium quasi in templum defugito, neve pluris lucrum foris quam domi securitatem facito Et studio regio verso, modo tibi faveat Deus, nihil tibi damno fuerit. Zeno enim Citiensis re inter procellam amissa ad sapientiae studium togamque brevem et duriorem victum ubi recesserat, fortunae gratias egit quod sibi ita opportune nocuisset. Et aquilone acri, tristi imbre, soli stulti sedentes flent, sapientis est se toga, igne, tecto defendere. Et ubi malae fortunae tempestas in nos inciderit, decet hoc ipsum in lucrum vertere, spectato an ad aliud quid prosit, sive ad fortiores sive ad sapientiores reddendos, sive ad securitatem dandam, sive ad invidiam arcendam. Omnia enim in melius verti potuerint, modo ipsi hoc velimus.

III Bethink yourself of the State, I beseech you, even now, Marcus Antonius · think of those from whom you have sprung, not of those with whom you now associate · deal with me as you like, but make up your quarrel with the State About your own course, however, you yourself will decide : I will openly profess my own. I defended the State in my youth, I will not abandon it in my age : I scorned the swords of Catiline, I will not fear yours. Nay, rather I would gladly offer my body, if by my death the freedom of the State can be immediately recovered, so that at last the pangs of the Roman people may give birth to that with which they have so long been in travail. If, nearly twenty years ago, I said in this very temple that death could not be untimely for one who had filled the consulship, how much more truly shall I say this now of an old man ! For me indeed, Senators, death is even to be desired, now that I have run the course of honour and achievement.

I have only two wishes. One is that at my death I may leave the Roman people free and no greater gift than this could be granted me by Heaven ! The other is that as each man has deserved of the State, such may be that man's reward.

LESSON 10

Numerals, Fractions, Percentages, Money, and the Calendar

THERE are four main kinds of numerals : cardinal, ordinal, distributive, and adverbial. The cardinals (one, two, three) answer the question *quot* = how many ; they are adjectives. The ordinals (first, second, third) answer the question *quotus* = which in numerical order ; they are all declinable adjectives. The distributives (one each, two each) answer the question *quotēni* = how many each ; they are all declinable plural adjectives. The adverbial numerals (once, twice) answer the question *quotiens* = how many times ; being adverbs, they are indeclinable.

The cardinal numbers from *quattuor* to *centum*, inclusive, are indeclinable ; *ūnus* has been declined in Lesson 4, p. 1099 ; *duo* and *trēs* are declined thus :

	Masc.	Fem.	Neut.
Nom.	*duo*	*duae*	*duo*
Acc	*duōs* (or *duo*)	*duās*	*duo*
Gen	*duōrum*	*duārum*	*duōrum*
D. and Abl	*duōbus*	*duābus*	*duōbus*
Nom	*trēs*		*tria*
Acc.	*trēs*		*tria*
Gen.		*trium*	
D. and Abl		*tribus*	

Ambō (both) is declined like *duo*.

Mille, used as an adjective, is indeclinable ; but when used as a noun it has a declinable plural *mīlia, mīlium, mīlibus* – e.g. *mille mīlitēs* = 1,000 soldiers ; *tria mīlia mīlitum* 3,000 soldiers (literally, three thousands of soldiers).

Duo- and *ūn-* in composition (as in *duodēcentum* = 98) do not change, whatever the case or gender.

The distributives are used :

1. To denote that the number belongs to each of several persons or things—e.g. *quīnōs comitēs adduximus* = we brought five companions each.

2. In expressions of multiplication—e g. *bis bīna* = twice two ; *deciens centēna mīlia* = a million each (100,000 taken each of ten times).

3. With nouns which have no singular, or which differ in meaning in singular and plural—e.g. *bīna castra* = two camps. In this sense, *ūnī*, not *singulī*, is used (*see* Lesson 4, p. 1099, *ūna castra*) ; also *trīnī*, not *ternī*—e.g. *trīnae aedēs* = three houses (*aedēs* in singular = room or temple ; in plural = a set of rooms i.e. a house).

Multiplicative adjectives are formed with the suffix *-plex* = -fold — e.g. *simplex, duplex, triplex, decemplex, centuplex.*

Every other is expressed by *alternī*—e.g. *alternīs diēbus* = every other day (ablative of time when: literally, every second day).

Fractions and Percentages

All fractions in Latin with 1 for numerator are denoted by ordinals, with or without *pars*: $\frac{1}{3}$ = *tertia*, or *tertia pars*; $\frac{1}{4}$ = *quarta*. All fractions with a numerator less by one than the denominator are denoted by cardinals with *partēs* simply: $\frac{2}{3}$ = *duae partēs*; $\frac{5}{6}$ = *quinque partēs*. All fractions with 12, or its multiples, for a denominator, are denoted by the parts of an *As* (see below), which is taken as the whole: *Hērēs ex asse* = heir to the whole estate. *Hērēs ex triente* = heir to a third. *Hērēs ex sēmisse* = heir to a half. Other fractions are denoted by the cardinal for the numerator and the ordinal for the denominator: $\frac{4}{7}$ = *quattuor septimae*.

Most of the Roman weights and measures were divided by fractions which were originally parts of the *As* or pound weight, containing twelve ounces.

THE FOUR NUMERALS

Cardinal	Ordinal	Distributive	Adverbial
1 *ūnus, -a, -um*	*prīmus, -a, -um* / *prior* (of two)	*singulī, -ae, -a*	*semel*
2 *duo, -ae, -o*	*secundus* / *alter*	*bīnī*	*bis*
3 *trēs, trēs, tria*	*tertius*	*ternī* or *trīnī*	*ter*
4 *quattuor*	*quartus*	*quaternī*	*quater*
5 *quinque*	*quintus*	*quīnī*	*quinquiens*
6 *sex*	*sextus*	*sēnī*	*sexiens*
7 *septem*	*septimus*	*septēnī*	*septiens*
8 *octō*	*octāvus*	*octōnī*	*octiens*
9 *novem*	*nōnus*	*novēnī*	*noviens*
10 *decem*	*decimus*	*dēnī*	*deciens*
11 *undecim*	*undecimus*	*undēnī*	*undeciens*
12 *duodecim*	*duodecimus*	*duodēnī*	*duodeciens*
13 *trēdecim*	*tertius decimus*	*ternī dēnī*	*terdeciens*
14 *quattuordecim*	*quartus decimus*	*quaternī dēnī*	*quater deciens*
15 *quindecim*	*quintus decimus*	*quīnī dēnī*	*quindeciens*
16 *sēdecim*	*sextus decimus*	*sēnī dēnī*	*sēdeciens*
17 *septemdecim*	*septimus decimus*	*septēnī dēnī*	*septiens deciens*
18 *duodēvīgintī* (two from 20)	*duodēvīcēsimus*	*duodēvīcēnī*	*duodēvīciens*
19 *undēvīgintī*	*undēvīcēsimus*	*undēvīcēnī*	*undēvīciens*
20 *vīgintī*	*vīcēsimus*	*vīcēnī*	*vīciens*
21 *ūnus et vīgintī* or *vīgintī ūnus*	*ūnus et vīcēsimus* (rarely *prīmus*)	*vīcēnī singulī*	*semel et vīciens*
30 *trīgintā*	*trīcēsimus*	*trīcēnī*	*trīciens*
40 *quadrāgintā*	*quadrāgēsimus*	*quadrāgēnī*	*quadrāgiens*
50 *quinquāgintā*	*quinqāgēsimus*	*quinquāgēnī*	*quinquāgiens*
60 *sexāginta*	*sexāgēsimus*	*sexāgēnī*	*sexāgiens*
70 *septuāgintā*	*septuāgēsimus*	*septuāgēnī*	*septuāgiens*
80 *octōgintā*	*octōgēsimus*	*octōgēnī*	*octōgiens*
90 *nōnāgintā*	*nōnāgēsimus*	*nōnāgēnī*	*nōnāgiens*
100 *centum*	*centēsimus*	*centēnī*	*centiens*
200 *ducentī, -ae, -a*	*ducentēsimus*	*ducēnī*	*ducentiens*
300 *trecentī*	*trecentēsimus*	*trecēnī*	*trecentiens*
400 *quadringentī*	*quadringentēsimus*	*quadringēnī*	*quadringentiens*
500 *quingentī*	*quingentēsimus*	*quingēnī*	*quingentiens*
600 *sescentī*	*sescentēsimus*	*sescēnī*	*sescentiens*
700 *septingentī*	*septingentēsimus*	*septingēnī*	*septingentiens*
800 *octingentī*	*octingentēsimus*	*octingēnī*	*octingentiens*
900 *nongentī*	*nongentēsimus*	*nongēnī*	*nongentiens*
934 *nongentī trīgintā quattuor*			
1,000 *mille*	*millēsimus*	*singula mīlia*	*milliens*
2,000 *duo mīlia*	*bis millēsimus*	*bīna mīlia*	*bis milliens*
500,000 *quingenta mīlia*	*quingentiens millēsimus*	*quingēna mīlia*	*quingentiens milliens*
1,000,000 *deciens centum mīlia*	*deciens centiens millēsimus*	*deciens centēna mīlia*	*deciens centiens milliens*

Table of Weights

Unciae, Ounces		Fractions of As
12	As, *a pound*	1
11	Deunx (de -*uncia*), *an ounce off*	$\frac{11}{12}$
10	Dextans (dēsextans), *a sixth off*	$\frac{5}{6}$
9	Dodrans (dēquadrans), *a fourth off*	$\frac{3}{4}$
8	Bēs, or Bessis (dui-assis)	$\frac{2}{3}$
7	Septunx (septem unciae), *seven ounces*	$\frac{7}{12}$
6	Sēmissis, or Semis (semi-assis)	$\frac{1}{2}$
5	Quincunx (quinque unciae)	$\frac{5}{12}$
4	Triens, *a third*	$\frac{1}{3}$
3	Quadrans, *a fourth*	$\frac{1}{4}$
2	Sextans, *a sixth*	$\frac{1}{6}$
1	Uncia, *an ounce*	$\frac{1}{12}$

Other fractions used were *Sescuncia* ($1\frac{1}{2}$ ounces), *Sēmuncia* ($\frac{1}{2}$ ounce), *Sīcilicus* ($\frac{1}{4}$ ounce), *Sextula* ($\frac{1}{6}$ ounce), *Scripulum* ($\frac{1}{24}$ ounce).

After 80 B.C. legal interest was fixed at the rate of $\frac{1}{100}$ of the capital per month, called Centesima (sc. *pars*)—i.e. 12 per cent. per annum. Lower rates than this were denoted by the fractional parts of the *As* (the Centesima being taken as the As). Reckoning percentage as per annum:

12 per cent. = *ūsūrae centēsimae*, or *assēs usūrae*.
11 per cent. = *ūsūrae deuncēs*.
8 per cent. = *ūsūrae bessēs*.
5 per cent. = *ūsūrae quincuncēs*
1 per cent. = *ūsūrae unciae*.

Higher rates than 12 per cent. were denoted by distributives:

24 per cent. = *bīnae centēsimae*.
60 per cent. = *quīnae centēsimae*.

Money

The *dēnārius* (= 10 asses) was the silver coin in most frequent currency, but the ordinary unit of reckoning was the *sestertius*, or *nummus* (= $\frac{1}{4}$ denarius, or $2\frac{1}{2}$ asses). The Roman sign

for 2½ was IIS—i.e. II + S(emis). This is now written HS, and is the usual abbreviation for a sestertius. 7,000 sesterces = *septem mīlia sestertium* (shortened from *sestertiōrum*).

This shortened form *sestertium* was taken for a neuter singular noun, meaning 1,000 sesterces, and so we get such forms as

Sestertia decem = 10,000 *sesterces*.

For sums of a million sesterces and upwards adverbial numerals are used—e.g. 1,000,000 sesterces = *deciens centēna mīlia sestertium* (or just *deciens sestertium*).

2,300,000 sesterces = *ter et viciens sestertium*.

To distinguish the meanings, strokes were usually added to the numerals—e.g. HS$\bar{X}$ = *decem mīlia sestertium* (10,000); HS|X| = *deciens sestertium* (1,000,000).

Writing the Date

In the Roman calendar the year originally began with March; therefore, July was the fifth, September the seventh month, and so on. Every Roman month had three chief days: *Kalendae, -ārum* (Calends); *Nōnae, -ārum* (Nones); *Idūs, Iduum* (Ides): all three feminine. The Calends were always on the 1st; the Nones usually on the 5th, and the Ides usually on the 13th. In March, May, July, and October the Nones and Ides were two days later, i.e. on the 7th and 15th.

From these days the Romans counted *backwards*, the days between the 1st and the Nones being reckoned as so many days before the Nones; the days between the Nones and the Ides as so many days before the Ides; and the remaining days of the month as so many days before the Calends of the next month.

In expressing dates the Romans employed the names of the months as adjectives:

Jānuārius, -a, -um	*Quintīlis, -e* (or *Jūlius*)
Februārius, -a, -um	*Sextīlis, -e* (or *Augustus*)
Martius, -a, -um	*September, -bris, -bre*
Aprīlis, -e	*Octōber, -bris, -bre*
Māius, -a, -um	*November, -bris, -bre*
Jūnius, -a, -um	*December, -bris, -bre*

Quintīlis and *Sextīlis* were later called *Jūlius* and *Augustus* in honour of Julius Caesar and the Emperor Augustus.

When the date falls on one of the three chief days, the date is put in the ablative, the month agreeing with the noun.

Jan. 1. *Kalendis Jānuāriīs*
March 15. *Idibus Martiīs*
Nov. 5. *Nōnīs Novembribus*

The day immediately preceding any of these three points was called *prīdiē* (i.e. *priōre diē*), followed by the accusative.

Jan. 31. *Prīdiē Kalendas Februārias*
Apl. 12. *Prīdiē Idūs Aprīlēs*
Oct. 6. *Prīdiē Nōnas Octobrēs*

In any other date, we find out how many days it is before the next Calends, Nones, or Ides (remembering to count in both the date in question *and* the Calends, etc.). Thus, Jan. 30 is the *third* day before the Calends of February, and would be in Latin *ante diem tertium Kalendas Februārias*.

Further examples:

Dec. 2. *Ante diem quartum Nōnas Decembrēs.*
March 16. *a.d. septimum decimum Kalendas Aprīlēs.*

These are usually written "a.d. IV. Non. Dec.," and "a.d. XVII. Kal. Ap.," and so with the others. The original signification of this expression seems to have been "before (on the fourth day) the Nones of December," the exact day being thrown in parenthetically, and attracted from ablative to accusative because it followed *ante*.

In Leap Year, Feb. 24 (a.d. VI. Kal. Mart.) was reckoned twice; hence this day was called *diēs bissextus*, and leap year itself, *annus bissextilis*.

The ordinals, not the cardinals are used in writing the year—e.g. in 1943 = *annō millēsimo nongentēsimo quadrāgēsimō tertiō*.

Translation I

This is part of a letter from Cicero to his friend Atticus, written in March, 46 B.C.

Undecimo die postquam a te discesseram, hoc litterularum exaravi egrediens e villa ante lucem, atque eo die cogitabam in Anagnino, postero autem in Tusculano, ibi unum diem. V. Kalend. igitur ad constitutum; atque utinam continuo ad complexum meae Tulliae, ad osculum Atticae possim currere! quod quidem ipsum scribe, quaeso, ad me, ut, dum consisto in Tusculano, sciam quid garriat, sin rusticatur, quid scribat ad te, eique interea aut scribes salutem aut nuntiabis, itemque Piliae. Et tamen, etsi continuo congressuri sumus, scribes ad me, si quid habebis.

Translation II

The student should read a book of Caesar and a book of Virgil as early as possible. The following passage is taken from Virgil's *Aeneid*, a history of the fall of Troy and the adventures of Aeneas thereafter There are twelve books, and this passage is from Book II, lines 234-249. It describes the stratagem of the Wooden Horse (containing armed men), by which the Greeks brought about Troy's fall. The Trojans dragged the horse into their city as a prize of war, and in the night the Greeks hidden inside the horse emerged and opened the gates to their comrades outside. N.B. "And" is often translated by *-que* joined to the end of a word.

Dividimus muros, et moenia pandimus urbis.
Accingunt omnes operi, pedibusque rotarum (*a*)
Subjiciunt lapsus (*a*), et stuppea vincula collo
Intendunt. Scandit fatalis machina muros
Feta armis. Pueri circum innuptaeque puellae
Sacra canunt, funemque manu contingere gaudent.
Illa (*b*) subit, mediaeque minans inlabitur (*c*) urbi.
O patria, O divom (*d*) domus Ilium et incluta bello
Moenia Dardanidum! quater ipso in limine portae
Substitit (*e*), atque utero sonitum quater arma
dedere (*f*):
Instamus, tamen, immemores, caecique furore,
Et monstrum infelix sacrata sistimus arce.
Nos delubra deum (*g*) miseri, quibus ultimus esset
Ille dies, festa velamus fronde per urbem.

NOTES: (*a*) *Lapsus rotarum* = gliding wheels, or rollers (literally, glidings of wheels; *lapsus* is acc. pl. 4th decl., and is direct object to *subjiciunt*; *pedibus* is indirect object, and therefore dative). (*b*) *Illa* = it, i.e. *machina*: nom. fem. sing. (*c*) *Inlabitur*, though passive in form, is active in meaning: a deponent verb (*d*) *Divom* = *divorum* = *deorum*. (*e*) Perfect of

subsisto. (*f*) = ***dederunt.*** (*g*) ***Deum*** is often used for ***deorum***, gen. pl.

KEY TO TRANSLATION IN LESSON 9

Dies erat quo inferebantur tumulo reliquiae illius qui Protectoris nomen occupaverat. Me, quamvis neque viri memoriae neque operosae publicarum sollemnitatum vanitatis admodum studiosum, perpulere tamen sociorum preces ut cum iis spectarem pompam illam, quae tam cupide iamdudum fuerat expectata, ut nonnulli curiosiores, limatissimo nimirum ingenio homines, usque a monte apud Cornubios et ab Orcadibus insulis visendi causa in urbem progressi essent. Intellexi multo plus in funus erogatum esse quam pro mortui meritis, immo pro mortis ipsius dignitate Ingens pullatorum ordo, assistentibus etiam quibusdam legatis, qui regum personas fratrem summo studio desiderantium sustinerent : feretrum splendidissimum ; coronata effigies , denique, ne omnia alia commemorem quae, utpote in regum funeribus sollemnia, hic nullo modo omitti poterant, pars haud exigua spectaculi fuit, ut fit vasta spectantium multitudo.

LESSON 11

Oddities among Nouns and Verbs

MANY Latin nouns have no plural—e.g. proper names and abstract nouns, and words like *argentum* (silver), *aurum* (gold), *ferrum* (iron), *āēr* (air), *aether* (sky) ; and many nouns have no singular—e.g. certain names of towns, as *Thēbae* (Thebes), *Athēnae* (Athens) ; parts of the body ; names of feasts or days, as *fēriae* (holiday), *nundinae* (market-day) ; and words like *dīvitiae* (riches), *līberī* (children), *mānēs* (ghosts), *penātēs* (household gods), *moenia* (town walls), *tenebrae* (darkness).

Some nouns change their meaning in the plural :

Singular	*Plural*
castrum, fort	*castra*, camp
aedēs, temple, room	*aedes*, house
aqua, water	*aquae*, watering-place
auxilium, assistance	*auxilia*, auxiliary troops
cōpia, plenty	*cōpiae*, supplies, troops
impedimentum, hindrance	*impedimenta*, baggage
littera, letter (of the alphabet)	*litterae*, epistle
opem (acc), help	*opēs*, resources
opera, work	*operae*, workmen
rostrum, beak	*rostra*, orators' platform at Rome (because adorned with " beaks " of ships captured at Antium)
lūdus, play	*lūdī*, public games
carcer, prison	*carceres*, barriers (in horse races)

Many nouns are defective in case. The following, for instance, have no nominative : *dapem* (feast), *frūgem* (fruit), *opem* (help), *precem* (prayer), *vicem* (change). *Vīs* (force, strength) is thus declined :

	Singular	*Plural*
N., V.	*vīs*	*vīrēs*
Acc.	*vim*	*vīrēs*
Gen.	(none)	*vīrium*
Dat.	(none)	*vīribus*
Abl.	*vī*	*vīribus*

Other defective nouns are *forte* (by chance [abl.]), *sponte* (by one's own choice [abl.]), *fās* (right), *nefās* (wrong), *nihil* (nothing), *opus* (need), *instar* (likeness), *necesse* (necessity), *māne* (morning). These are practically indeclinable.

The following list of nouns with their genitive singular and nominative plural will be useful. (If these two cases of a noun are known, the whole noun can be declined : for if the nominative plural ends in *a*, the noun is neuter, and therefore the accusative will be the same as the nominative, both singular and plural.)

Some Anomolous Nouns

Nom. singular	Gen. singular	Nom. plural
pecūs, f. head of cattle	*pecudis*	*pecudēs*
pecus, n. cattle	*pecoris*	*pecora*
grūs, f. crane	*gruis*	*gruēs*
mūs, com mouse	*mūris*	*mūrēs*
incūs, f. anvil	*incūdis*	*incūdēs*
vulgus, n. common people	*vulgi*	*vulga*
vīrus, n. poison	*vīri*	*vīra*
tellus, f earth	*tellūris*	*tellūrēs*
supellex, f. furniture	*supellectilis*	*supellectilēs*
vās, m. bail	*vadis*	*vadēs*
vās, n. vessel	*vāsis*	*vāsa*
pecten, m. comb	*pectinis*	*pectinēs*
cucumis, m. cucumber	*cucumeris*	*cucumerēs*
pulvis, m. dust	*pulveris*	*pulverēs*
cuspis, f. shield	*cuspidis*	*cuspidēs*
glis, m. dormouse	*glīris*	*glīrēs*
lis, f. lawsuit	*lītis*	*lītēs*
ōbex, com. bolt	*ōbicis*	*ōbicēs*
mās, m. male	*maris*	*marēs*
seges, f. crop	*segetis*	*segetēs*
merges, f. sheaf	*mergitis*	*mergitēs*
mercēs, f. reward	*mercēdis*	*mercēdēs*
hērēs, com. heir	*hērēdis*	*hērēdēs*
compēs, f. fetter	*compedis*	*compedēs*
carō, f. flesh	*carnis*	*carnēs*
margo, com. border	*marginis*	*marginēs*
cupīdo, f. desire	*cupīdinis*	*cupīdinēs*
pugio, m. dagger	*pugiōnis*	*pugiōnēs*
nex, f. death	*necis*	*necēs*
nix, f. snow	*nivis*	*nivēs*
senex, m. old man	*senis*	*senēs*
bōs, com ox	*bovis*	*bovēs*
Jūpiter, m. Jupiter	*Jovis*	
iter, n journey	*itineris*	*itinera*
iecur, n. liver	*jecinoris* (or *iecoris*)	*jecinora*
gigās, m. giant	*gigantis*	*gigantēs*
jūs, n. right	*jūris*	*jūra*
falx, f. scythe	*falcis*	*falcēs*
vātes, com. prophet	*vātis*	*vātēs*

NOTE : *Bōs* has genitive plural *boum* ; dative and ablative plural *bōbus* or *būbus*.

Respublica (commonwealth) and *jusjūrandum* (oath) decline both halves : accusative *rempublicam*, genitive *reīpublicae*, ablative *rēpublicā* (*rēs* is fifth declension like *diēs*). So, accusative *jusjūrandum*, genitive *jūrisjūrandī*.

Peculiarities among verbs include the deponent, quasi-passive, semi-deponent, anomalous, defective, and impersonal verbs.

Deponent Verbs

These are chiefly passive in form, but active in meaning—e.g. *vēnor, venarī* — to hunt; *utor, ūtī* to use. They are found in each of the four conjugations. They are conjugated like the passive voice of a verb of the same conjugation: thus, *Vēnor* (like *amor*), *vēnārī, vēnātus sum*. In the infinitive, however, they combine active and passive forms—e.g. *Utor*:

Pres. infin.	*ūtī*, to use
Perf. infin.	*ūsus esse*
Fut. infin.	*ūsūrus esse*
Supines	*ūsum, ūsū*
Pres. ptc.	*utens*, using
Perf ptc.	*ūsus*, having used
Fut. ptc	*ūsūrus*
Gerunds	*ūtendum -ī, -ō*
Gerundive	*ūtendus*

The fact of their having a perfect participle with an active meaning makes them very useful for translating the English "having used," "having hunted," etc. Thus, for "having spoken thus, the queen died," if we use the deponent *loquor, loquī, locūtus* for "speak," we can say *Ita locūta, rēgina mortua est*. But if we used *dīcō* for "speak," we could not use *dictus*, which means "having been spoken." We should then have to say either (1) *hīs dictīs* (these things having been spoken [ablative absolute], *rēgīna mortua est*; or (2) *quum ita dixisset, rēgina mortua est*.

Quasi-Passive Verbs

These are the exact opposite of deponents, being active in form and passive in meaning—e.g. *fīō* = I am made; *exulō* = I am banished; *līceō* = I am put to auction; *vapulō* = I am beaten; *veneō* (compound of *eō* = I go) = I am on sale (used as the passive of *vendō* = I sell).

Semi-deponent Verbs

A few verbs have an active present, and a perfect of passive form; these are called "semi- or half-deponents";

Audeō, I dare	Perf. *ausus sum*, I dared
Fīdō, I trust	,, *fīsus sum*, I trusted
Gaudeō, I rejoice	,, *gāvīsus sum*, I rejoiced
Soleō, I am wont	,, *solitus sum*, I was wont

Anomalous Verbs

These are verbs that do not form all their parts according to rule. The following are the most common: *possum* (*pote sum*) = I am able; *volō* = I wish; *nōlō* (*ne-volō*) = I am unwilling; *mālō* (*magis-volō*) = I prefer; *ferō* = I bear; *fīō* = I am made, I become (used as the passive of *faciō*, I make); *eō* = I go; *queō* and *nequeō* = I can and I cannot; and *edō* = I eat.

Indicative Mood

PRESENT

	Sing.	Plur.		Sing.	Plur.
1	*possum*	*possumus*	1	*nōlō*	*nōlumus*
2	*potes*	*potestis*	2.	*nonvīs*	*nonvultis*
3	*potest*	*possunt*	3	*nonvult*	*nōlunt*

1.	*volō*	*volumus*	1.	*mālō*	*mālumus*
2.	*vīs*	*vultis*	2.	*māvīs*	*māvultis*
3.	*vult*		3.	*māvult*	*mālunt*

Sing.	Plur.	Sing.	Plur.	Sing.	Plur.
1. *eō*	*īmus*	1. *ferō*	*ferimus*	1. *fīō*	—
2. *īs*	*ītis*	2. *fers*	*fertis*	2. *fīs*	—
3. *it*	*eunt*	3. *fert*	*ferunt*	3. *fit*	*fīunt*

FUTURE SIMPLE

Pot-	*erō*	*eris*	*erit*	*erimus*	*eritis*	*erunt*
Vol- *Nōl* *Māl-* *Fer-* *Fī-*	*am*	*es*	*et*	*ēmus*	*ētis*	*ent*
I-	*bō*	*bis*	*bit*	*bimus*	*bitis*	*bunt*

IMPERFECT

Pot-	*eram*	*erās*	*erat*	*erāmus*	*erātis*	*erant*
Vole- *Nōle-* *Māle-* *Fere-* *Fīē-* *I-*	*bam*	*bās*	*bat*	*bāmus*	*bātis*	*bant*

PERFECT, FUTURE PERFECT, AND PLUPERFECT

Potu- *Volu-* *Nōlu-* *Mālu-* *Tul-* — *Iv-*	1. *ī*	*istī*	*it*	*imus*	*istis*	*ērunt* or *ēre*
	2. *erō*	*eris*	*erit*	*erimus*	*eritis*	*erint*
	3. *eram*	*erās*	*erat*	*erāmus*	*erātis*	*erant*

Subjunctive Mood

PRESENT

Poss- *Vel-* *Nōl-* *Māl-*	*im*	*is*	*it*	*imus*	*itis*
Fer- *Fī-* *E-*	*am*	*ās*	*at*	*āmus*	*ātis*

IMPERFECT

Poss- *Vell-* *Noll-* *Mall-* *Ferr-* *Fier-* *Ir-*	*em*	*ēs*	*et*	*ēmus*	*ētis*

PERFECT AND PLUPERFECT

Potu- *Volu-* *Nōlu-* *Mālu-* *Tul-* — *Iv-*	1. *erim*	*eris*	*erit*	*erimus*	*eritis*	*erint*
	2. *issem*	*issēs*	*isset*	*issēmus*	*issētis*	*issent*

Imperative Mood

possum, volō, mālō, have none

PRESENT		FUTURE		
2nd Sing.	2nd Pl.	2nd Sing.	2nd Pl.	3rd Pl.
nōlī	*nōlīte*	*nōlīto*	*nōlitōte*	*nōluntō*
fer	*ferte*	*fertō*	*fertōte*	*feruntō*
fī	*fīte*	—	—	—
ī	*ite*	*itō*	*itōte*	*euntō*

Infinitive Mood

PRESENT	PRES. PARTICIPLE	SUPINES
posse	*potens* (used as adj. = powerful)	—
velle	*volens*	—
nolle	*nōlens*	—
malle	—	—
ferre	*ferens*	*lātum, lātū*
fierī		—
īre	*iens* (genitive *euntis*)	*itum, itu*

Infinitive Mood (*contd.*)

PERFECT PARTICIPLE PASSIVE

Fīō and *ferō* have perf. ptc. pass. *factus* and *lātus*. *Factus* is used with *sum*, etc., to form the perfect tenses of *fīō*.

Feror (passive of *fero*) has pres. indic. : 2. *ferris*, 3 *fertur*.

Queō and *nequeō* . conjugated like *eō*, so far as regards the forms that are found. Cicero uses *non queō* instead of *nequeō* in 1st pers. pres. indic.

Edō (I eat) often changes some of its forms :

IND. PRES. 2nd Pers. Sing.	IND. PRES. 3rd Pers. Sing.	INFINITIVE
edis or *ēs*	*edit* or *est*	*edere* or *esse*

Defective Verbs

These lack some of a verb's usual parts :

1. *Odī* (I hate), *memini* (I remember), *coepī* (I begin), are perfects, without any present-stem tenses. *Nōvi* (I know), from *noscō*, is similarly used. Thus : "To hate" = *ōdisse* ; "I remembered" *memineram* (pluperfect).

Memini has imperative *mementō*, *mementōte*.

Coepī and *ōdī* have perfect and future participles—*coeptus* and *coeptūrus*, *ōsus* and *ōsūrus*.

2 Many verbs have perfect without supine, and some have neither perfect nor supine, e.g. most inceptive verbs (*see below*).

3. *Inquam* (I say) has the following parts :

	1	2	3
Present	*inquam*	*inquis*	*inquit*
	inquimus	*inquitis*	*inquiunt*
Imperfect		–	*inquiēbat*
	—		*inquiēbant*
Future	—	*inquies*	*inquiet*
Perfect	—	*inquisti*	*inquit*
Imperative	—	*inque*	—
		inquite	—

Aio (I say, I affirm) has .

	1	2	3
Present	*aiō*	*ais*	*ait*
		—	*aiunt*
Imperfect	*aiebam* (complete)		
Pres. subj.		*aias*	*aiat*
	-	- -	*aiant*

Fārī (to speak)—deponent—has · *fātur* (he speaks) ; *fābor* (I shall speak), *fāre* (speak thou); *fāri*, *fātus*, *fandus*.

Impersonal Verbs

These are conjugated only in the third person singular of the finite verb, and in the infinitive.

1. The following are used with the accusative : *oportet* (it behoves), *decet* (it beseems), *dēdecet* (it misbeseems), *piget* (it irks), *pudet* (it shames), *poenitet* (it repents), *taedet* (it wearies), *miseret* (it moves pity) all second conjugation ; also, *dēlectat* (it charms) and *juvat* (it delights)—first.

2. The following are used with the dative : *libet* (it pleases), *licet* (it is lawful), *liquet* (it is clear)—second conjugation ; also *accidit*, *contingit* (third), *ēvenit*, *convenit*, *expedit* (fourth).

Examples : *oportet mē īre* : I must go ; *licuit tibi rīdere* : you were allowed to laugh.

3. *Pudet*, *piget*, *taedet*, *poenitet*, *miseret*, are used with an acc. of the person feeling, and a genitive of what causes the feeling : *taedet mē vītae* : I am weary of life.

4 *Interest* and *refert* (it concerns, or it is important for) take the genitive of the person concerned—e.g. *Caesaris interest pontem facere* it is in Caesar's interest to build a bridge. (This construction is rare with *refert* : say, *ad Caesarem refert*.) But *possessive pronouns* are used in the *ablative feminine* e.g. *Quid meā refert ?* What does it signify to me ? *Magis nullius interest quam tuā*=It concerns no one more than yourself.

The *meā* and the *tuā* probably agree with *rē* understood. *Meā rēfert* was originally *meae reī fert*, and then, *reī* being shortened to *re*, *meae* became *meā*. If this is so, *meā interest* is probably an imitation.

The **Frequentative Verbs** express repeated or intenser action, and are formed either (1) in -*tō*, -*sō*, from supine stems—e.g. *tractō*=I handle (from *trahō*, *traxī*, *tractum*=I draw) ; *cursō*=I run about (from *currō*, *cucurrī*, *cursum* =I run) ; or (2) by adding -*itō* to the last consonant of the present stem—e.g. *rogitō*=I ask often All frequentatives are first conjugation.

The **Inceptive Verbs** express beginning of action and are formed by adding -*scō* to the present stem of verbs, or from nouns by adding -*ascō* or -*escō* —e.g *juvenescō*=I begin to grow young ; *ignescō*=I burst into flame. All these are third conjugation.

The **Desiderative Verbs** express desire, and are formed by adding -*uriō* to the supine stem—e g. *esuriō* =I am hungry (from *edō*, *ēsum*=I eat). All these are fourth conjugation.

EXERCISE

1. Socrates was called to trial on the charge of corrupting youth, but in reality because he had become suspected by those in power. 2. He is too wise to err, too good to be unkind. 3. He came to such a pitch of folly that he could not be persuaded to eat. 4. It was resolved to send ambassadors to ask what was the meaning of these repeated insults. 5. I hear that she died four years after returning home: I fear that her children are in very poor circumstances. 6. If you help me, I shall rejoice ; if not, I shall not take it ill.

Translation I

THE GREAT ERUPTION OF VESUVIUS : August 24, A.D. 79.

Extract from letter of Pliny the Younger to Tacitus.

Nec multo post illa nubes descendere in terras, operire maria. Cinxerat Capreas et absconderat : Miseni quod procurrit, abstulerat. Tum mater orare, hortari, jubere, quoquo modo fugerem ; posse enim juvenem , se et annis et corpore gravem bene morituram, si mihi causa mortis non fuisset. Ego contra, salvum me, nisi una, non futurum · dein manum ejus amplexus, addere gradem cogo. Paret aegre, incusatque se, quod me moretur ; jam cinis, adhuc tamen rarus. Respicio , densa caligo tergis imminebat, quae nos, torrentis modo infusa terrae, sequebatur. Deflectamus, inquam, dum videmus, ne in via strati comitantium turba in tenebris obteramur. Vix

consederamus, et nox, non qualis illunis aut nubila, sed qualis in locis clausis lumine exstincto. Audires ululatus feminarum, infantium quiritatus, clamores virorum. Alii parentes, alii liberos, alii conjuges vocibus requirebant, vocibus noscitabant. Hi suum casum, illi suorum miserabantur. Erant qui metu mortis mortem precarentur. Multi ad deos manus tollere; plures, nusquam jam deos ullos, aeternamque illam et novissimam noctem mundo interpretabantur.

Translation 11

The following passage is from Virgil's Eclogues, or Pastoral Poems.

At tibi prima, puer, nullo munuscula cultu,
Errantes hederas passim cum baccare tellus
Mixtaque ridenti colocasia fundet acantho.
Ipsae lacte domum referent distenta capellae
Ubera, nec magnos metuent armenta leones.
Ipsa tibi blandos fundent cunabula flores.

Keys to Translations in Lesson 10

I. Eleven days after leaving you, I am scrawling this bit of a note as I am starting from my country-house before dawn. I think of being at my villa at Anagnia to-day, and Tusculum to-morrow. Only one day there, so I shall turn up to time on the 28th, and, oh that I could run on at once to embrace my Tullia and give Attica a kiss! As to this very thing, do write me, I beg you, that while I am stopping at Tusculum I may know what she is prattling or, if she is in the country, what she writes to you about. Meanwhile, either send or give her my love, and also to Pilia. Yet even though we shall meet immediately, write to me if you have anything to say.

II. We sunder the walls, and lay open the fortifications of the city. All gird themselves for the work, and put rolling wheels under its (i.e. the wooden horse's) feet, and fasten hempen bands on its neck. The fated engine climbs the walls, big with arms. Around it boys and unwedded girls sing hymns, and rejoice to touch the rope with their hand (i.e. to help to pull the horse into the city). It approaches and glides threatening into the midst of the city. O native land! O Ilium (Troy), home of the gods, and fortresses of the Dardanidae (Trojans) renowned in war! Four times in the very gateway did it halt, and four times the arms rattled (literally, gave a sound) in its womb. Yet we press on, unmindful and blind with frenzy, and plant the ill-omened monster in our sacred citadel. We deck the shrines of the gods throughout the city with festal foliage, wretched people, to whom that day was our last.

LESSON 12

Question and Answer: Idioms: Terminology

Questions to which an affirmative answer is expected are introduced in Latin by *nonne*: when a negative answer is expected, by *num*: but when the answer is an open matter, by the enclitic *-ne* added usually to the first word of the sentence. *Num putas bis bina esse quinque?*—you surely don't think that twice two are five, do you? *Nonne Caesar erat imperator maximus?* was not Caesar a mighty general? *Putasne me patris similem esse?*—do you think that I am like my father?

The above are all *direct questions*. In *indirect questions* i.e. questions depending on a verb—the verb in the question is subjunctive. "Whether" and "if" in such sentences are rendered by (1) *utrum*, followed by *an* or *ne*: (2) *num*. *Rogavit utrum haec vera essent annon* —he asked whether this was true or not.

Note: Distinguish between "whether" thus introducing an independent clause and "whether" used to express a condition; the latter is *sive*, a compound of *si*=if:

Haec, sive vera sunt sive falsa, nullo modo me movent=whether—i.e. if—this is true or false, I am not at all troubled by it.

There are no actual words for yes and no in Latin. An affirmative answer is expressed by *etiam, ita, factum, vero, verum, sane, ita vero, ita est, sane quidem*, etc., or by the proper pronoun, as *ego vero*: or by the verb repeated in the proper person: e.g. *sentio*. A negative answer is expressed by *non minime, minime vero*: or with the pronoun, *minime ego quidem*: or with the verb, *non sentio*. When the contrary is asserted by way of reply (implying "No, on the other hand" or "Nay, rather"), the expression is *immo* or *immo vero*.

Miscellaneous Idioms

English	*Latin*
Calpurnia married Caesar.	Calpurnia Caesari nupsit (lit., *veiled herself for Caesar*).
Caesar married Calpurnia.	Caesar Calpurniam in matrimonium duxit
He is the best scholar in the school.	Discipulorum, si quis alius, ille optime discit.
I fear you are wrong	Timeo ne erres.
I fear you are not wrong	Timeo ut erres.
I will do it if I can.	Hoc si *potero* (*fut.*) faciam
It does not fall to the lot of everybody to visit Naples	Non cuilibet contingit Neapolim videre.
There are some who think you are mad.	Sunt qui putent te insanire.
I am sorry to say this.	Invitus hoc dico.
He perished in his youth.	Juvenis mortuus est.
I have asked him to come to see me as quickly as possible.	Rogavi eum ut quam celerrime veniat me visum (*supine*).
I cannot write for weeping	Prae lacrimis scribere non possum.
One uses one tent, another another.	Alius alio tabernaculo utitur
All the best citizens are present.	Optimus quisque civis adest.
It is all over with me.	Actum est de me.
You ought to have done it before.	Antea te hoc facere oportuit (*note the pres. infinitive*).
On the march.	Ex itinere.
On horseback	Ex equo.
He departed without asking what I had done.	Discessit, neque quid fecissem rogavit (*or*, Ita discessit ut non rogaret, etc.). But not *sine* with gerund

Miscellaneous Idioms *(contd.)*

English	*Latin*
He came sooner than he was expected.	Opinione celerius venit
To be brief	Quid plura (dicam) ?
The House divided on the motion.	Pedibus in sententiam iverunt.
Once every four years.	Quarto quoque anno.
I am on the point of going.	In eo sum ut proficiscar.
In the open air	Sub divo.
The sisters loved one another	Sorores altera alteram amaverunt
I was within an inch of death.	Minimum afuit quin morerer
Mind you come.	Cura (*or* Fac) ut venias, *or simply* Cura venias (*Cura* is imperative of *curo*, *curare*.)
He is not a fit person for you to converse with.	Non est aptus quocum colloquaris.
I cannot walk even a mile, not to mention seven	Ne mille passus quidem ambulare possum, nedum septem (milia passuum)
At one time he is wise, at another a perfect fool	Modo sapiens, modo stultissimus est
I asked him what time it was, but he made no reply	Mihi interroganti quota hora esset, nihil respondit.
I am writing this letter on the 1st of April	Has literas (*or* hanc epistolam) Kalendis Aprilibus scribebam. (Epistolary imperfect, because to the reader the writing is *past*)
It would be tedious	Longum est.
It would have been better.	Melius fuit
All the world knows that you are not convinced.	Nemo est quin sciat tibi non persuasum esse.
Instead of thanking me, he abused me	Quum gratias mihi agere deberet, mihi maledixit.
This, then, is the reason why pay has been granted to the soldiers nor has it escaped our notice that this gift will be daubed with the poison of our enemies The liberty of the people has been sold ; our soldiery is removed for ever and banished from the city and from the republic no longer do they give way even for winter or the season of the year and visit their homes and possessions. What do you think is the reason for this prolonged service ?	*In Oratio Obliqua.* Hoc illud esse quod aera militibus sint constituta ; nec se fefellisse, id donum inimicorum veneno illitum fore. Venisse libertatem plebis , remotam in perpetuum et ablegatam ab urbe et ab republica juventutem : jam ne hiemi quidem aut tempori anni cedere ac domos ac res invisere suas Quam putarent continuatae militiae causam esse ? (Livy.)
The top of the mountain.	Summus mons.
From day to day.	Diem de die.
As far as I know.	Quod sciam.
No letter from you.	Nulla tua epistola.
To make many promises.	Multa polliceri.

Terminology

Here are defined some of the terms used for various rhetorical figures and idiomatic constructions common in Latin. The student is advised to memorise their definitions, since many of them are found in English literature.

Asyndeton (" not bound together "). The omission, for effect, of conjunctions : e.g. *di, homines* (gods and men).

Aposiopesis (" falling silent "). A sudden stopping on the part of the speaker, as though unwilling or unable to proceed : e.g. *Aeneid* I, 135 : *Quos ego—sed motos praestat componere fluctus* (whom I—but better 'tis to still the movèd waves).

Hendiadys (" one by means of two "). The presentation of one and the same notion in two expressions : e.g. " in goblets and gold " (in golden goblets) ; *chlamydem sinūsque* (the folds of the cloak : literally, the cloak and the folds).

Enclitic (" on-leaning "). A word or particle following a word and so united to it as to seem part of it : e.g. *-que*, *-ve*.

Patronymic (" named after father "). A title expressing descent from a father or ancestor : e.g. *Alcides* a male descendant of Alceus, a name applied to his son Amphitryon and, especially, to his grandson, Hercules ; *Anchisiades* son of Anchises.

Synesis (" meaning "). A construction in harmony with the sense rather than with strict syntax : e.g. *subeunt juventus auxilio tardi* = the young men come up slowly to the rescue. Here *subit* and *tarda* would have been strictly needed.

Zeugma (" yoking "). The using of one verb in two different senses : e.g. *Aeneid* I, 264 : *moresque viris et moenia ponet* and will set up laws and city walls for his warriors.

Oxymoron (" pointedly foolish "). An apparent contradiction in terms : e.g. " And faith unfaithful kept him falsely true " ; *splendide mendax* (nobly lying) ; *insepultam sepulturam* (a mockery of burial).

Periphrastic (" roundabout speech "). *Conjugation.* With auxiliary verb. The participles in *-urus*, *-dus* may be conjugated with all the tenses of *sum* : e.g. to form future subjunctive passive of *amo*, " *amaturus sim.*"

Litotes (" frugality "). Understatement : e.g. " a citizen of no mean city " ; *non innoxia verba* (deadly words.)

Hysteron-proteron (" later-earlier "). The idea, logically second, being put first : e.g. *moriamur et in media arma ruamus* (let us die, and rush into the thick of the fight).

Chiasmus (" cross-fashion "). " Back to back," crosswise construction (from the Greek letter *chi*, a diagonal cross) used to obtain a contrast : e.g. *A fronte mare, hostes a tergo imminebant* (in front the sea was the menace, in our rear the enemy).

Key to Exercise in Lesson 11

1. Socrates in judicium vocatus est quod corrumperet juventutem, re tamen ipsa quia in suspicionem magistratibus venerat. 2. Sapientior est quam qui erret, melior quam qui inclementer agat. 3. Eo stultitiae venit ut illi non persuaderi, posset ut ederet. 4. Placuit legatos mitti qui rogarent quid vellent hac tot contumeliae. 5. Nuntiatum est mihi illam anno quarto postquam domum rediisset mortuam esse : cujus liberi timeo ne pauperrimi sint. 6. Si mihi subvenies (*note tense*), gaudebo : sin minus, haud aegre feram.

Key to Translations in Lesson 11

I. Not long afterwards that cloud descended (*historic infinitive*) over the land and covered the sea. It had encircled Capreae and blotted it out: it had removed from our sight the promontory of Misenum. Then my mother begged, exhorted, ordered me to flee in whatever way I might, (saying) that a young man could, and that she, weighed down with years and weakness of body, would die happy if she had not been the cause of my death. I on the other hand (affirm) that I will not be saved unless with her: then clasping her hand, I urge her to quicken her pace. She obeys reluctantly, and blames herself for delaying me. Now there are ashes, as yet, however, few and far between. I look back: thick darkness overhung us in the rear, and kept following us, pouring over the land like a flood. "Let us turn aside," I say, "while we can see, lest being knocked down in the street we be trampled upon in the darkness by the crowd of our companions." Scarcely had we sat down when night (was upon us), not a mere moonless, cloudy night, but such night as there is in a closed room when the light is extinguished. You could hear the wailing of women, the cries of infants, the shouts of men. Some were seeking by the voice, by the voice were recognising parents, others children, others wives. These were pitying their own fate, those that of their loved ones. There were some who, through the fear of death, prayed for death. Many raised their hands to the gods: while more still imagined that there were no longer any gods anywhere, and that this was the final and everlasting night for the world.

II. On thee, child, the earth shall begin to pour forth without aught of tillage her simple gifts, straggling ivy with foxglove, and colocasia (Egyptian bean) twined with smiling bear's-foot. Of their own accord (ipsae) the she-goats shall bring home their udders swollen with milk, and the herds shall not dread the mighty lions. Thy very cradle shall pour forth flowers to caress thee.